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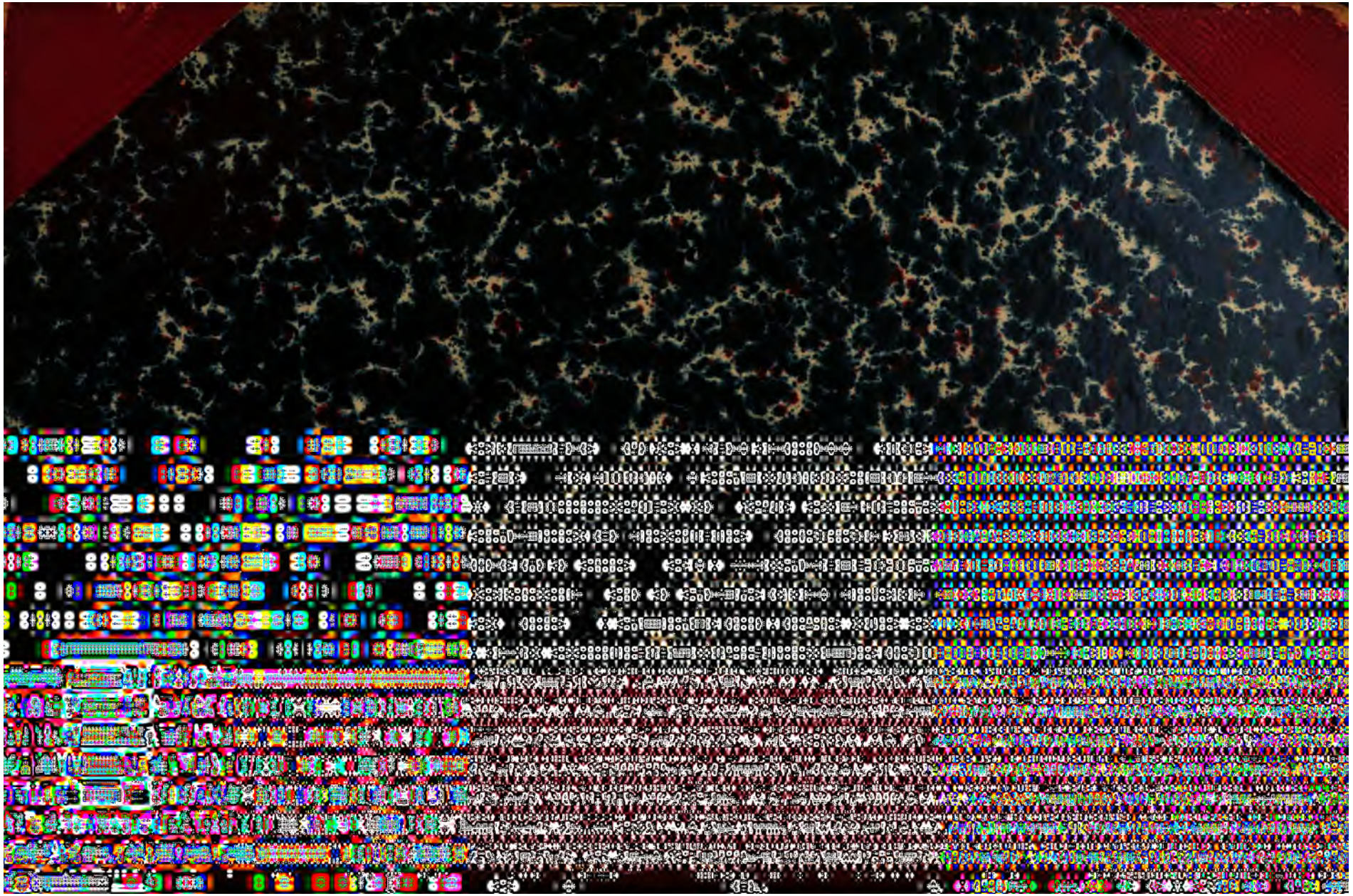

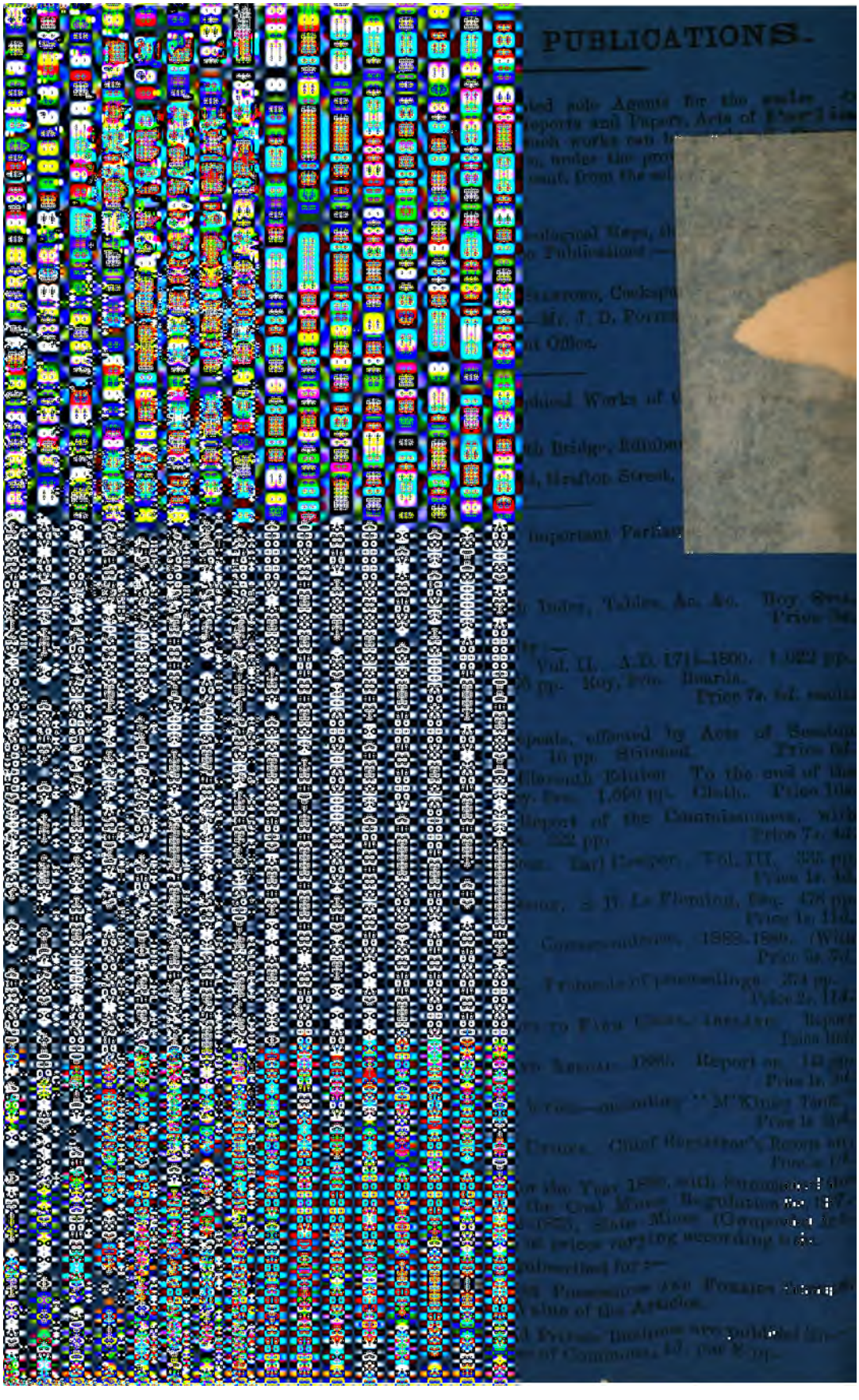
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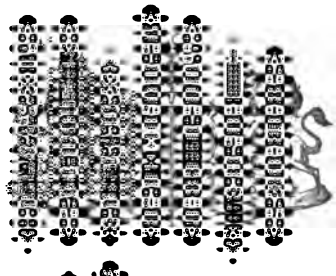

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THE METEOROLOGICAL COUNCIL,

1889–90.

Lieutenant-General RICHARD STRACHEY, R.E., C.S.I., F.R.S., Chairman.

MR. ALEXANDER BUCHAN, M.A., LL.D., F.R.S.E.

Professor GEORGE HOWARD DARWIN, M.A., LL.D., F.R.S.

MR. FRANCIS GALTON, M.A., F.R.S.

MR. EDWARD J. STONE, M.A., F.R.S.

Captain WILLIAM J. L. WHARTON, R.N., F.R.S., Hydrographer of the Admiralty.

REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1890.

Introductory.

THERE has been no change in the Council during the year. The executive officers are as in the last Report:—

Mr. R. H. Scott, M.A., F.R.S., Secretary.
Nav.-Lieut. C. W. Baillie, R.N., F.R.A.S., Marine Superintendent.

In the last Report it was mentioned that the Treasury had intimated to the Council that it was desirable to reduce the cost of printing for the Office; the action which has been taken to follow out this suggestion will lead to a considerable saving in the expense of the publications of the Office. The correspondence will be found in Appendix I. (p. 57).

The present Report is arranged under three headings:—

I. Ocean Meteorology.
II. Weather Telegraphy.
III. Land Meteorology of the British Isles.

PART I.

OCEAN METEOROLOGY.

Collection of information.

Collection of Information.—The practice followed by the Office with reference to observers at sea, as described in former Reports, remains unchanged.

Recognition of "excellent" observers.

Appendix II. (p. 60) contains a list of all the observers who during the past year have contributed logs classed as "excellent." Several of these observers have regularly co-operated with the

Recognition of "excellent" observers.

Office for many years. The names which appear in the list for the first time are as follow:—

Captain's Name.	Ship.
Angus, T. S.	S.S. "Canton."
Atkinson, G. W.	S.S. "Kaisar-i-Hind."
Cameron, Sub-Lieut. A. C. L., R.N.	H.M.S. "Stork."
De Horne, M.	S.S. "Rohilla."
Docherty, H.	"Baron Colonsay."
Drenning, W. B.	S.S. "Mira."
Garnsworthy, T.	S.S. "Ardancorrach."
Gillies, W.	S.S. "Medway."
Helby, Lieut. H. W. H., R.N.	H.M.S. Myrmidon."
Mitchell, G.	S.S. "Trinacria."
Owen, O.	S.S. "Cordelia."
Pasifull, E. J.	"Rahane."
Pope, J.	S.S. "Derwent."
Pullen, Commr. T. F., R.N.	H.M.S. "Stork."
Saul, J.	"Coronilla."
Sibery, H., R.N.R.	S.S. "Clan Cameron."
Stewart, A.	"County of Selkirk."
Thearle, J.	S.S. "Lennox."
Thompson, Lieut. H., R.N.	H.M.S. "Rambler."
Trevor-Roper, Dr. G. D., R.N.	H.M.S. "Stork."
Worrall, W. A.	"Camana."

Proportion of "excellent" to total number of logs received.

The total number of logs received in the year ending March 31, 1890, is 172, of which 136, or 79 per cent., have been classed as "excellent," being nearly the same per-centage of "excellent" logs as in last year.

The average number of logs received annually during the five years, 1884–88, was 186, of which the per-centage of "excellent" logs was 75.

The Council take this opportunity of expressing their best thanks to the observers who have assisted them during the past year.

They regret to have to announce the deaths of four of their observers; Capt. Hugh Campbell, ship "Holkar," who had kept 7 "excellent" logs; Capt. A. Hart Dyke, S.S. "La Plata," who had kept 2; Capt. W. Hughes, ship "Bolan," who had kept 9; and Comr. T. F. Pullen, H.M.S. "Stork," who had recently begun to observe.

Appendix III. (p. 63) gives a list of meteorological logs and of meteorological reports from stations abroad, received at the Office during the year.

Districts from which observations are obtained.

The following summary of the voyages of the ships observing for the Office shows the districts from which observations were received during the year:—

To Baffin's Bay or Greenland	2
„ North America, East Coast	28
„ „ „ West „	9
Off East Coast of North America	1
To West Indies	23

To South America, East Coast - - - -	13	Districts from which observations are obtained.
„ „ „ West „ - - - -	9	
„ Australia and New Zealand, viâ Cape of Good Hope	23	
„ „ „ „ Suez - -	1	
At Australian stations - - - - -	6	
To India, viâ Suez - - - - -	11	
„ India, viâ Cape of Good Hope - - -	18	
„ China, viâ Suez - - - - -	6	
„ Cape of Good Hope - - - -	10	
„ West Coast of Africa - - - -	1	
„ East „ „ - - - - -	1	
Between British Ports - - - - -	6	
To Mediterranean Ports - - - -	5	

Red Sea.

Red Sea Charts.—The discussion of the Meteorology of the Red Sea, mentioned in last Report, has now been completed, and the charts are nearly ready for engraving.

Cape Guardafui.

Cape Guardafui Charts.—Numerous additions have been made to these charts, which illustrate the winds, sea temperature, and currents for the entire year, and they are now being prepared for the engraver.

The Aden Cyclone.

The Aden Cyclone of June 1885.—The synchronous daily charts of two storms that occurred in this month have been completed, and will at once be engraved. They cover a period of six weeks, and are the first daily charts of this description that have been prepared for the Arabian Sea.

Indian Ocean Cyclones.

Cyclone Tracks in the Southern Indian Ocean.—These charts, which as stated in former reports have been compiled from the data furnished by Dr. Meldrum, showing the frequency and tracks of cyclones for nearly 20 years, arranged according to months, are now in the press, and will be issued immediately. Dr. Meldrum's original charts, showing the yearly tracks, will also be engraved and accompany those prepared in the Office.

Barometrical Pressure Charts.

The Charts of Barometrical Pressure for the Oceans.—The two charts mentioned in last Report, one exhibiting the mean barometrical pressure for the year, and the other indicating the extent of range in the barometrical readings taken in different districts, have been issued.

Current Charts.

Current Charts for the Atlantic, Pacific, and Indian Oceans.—The whole of the data relating to currents contained in the Office logs have been entered on the charts, and the Remark Books of H.M. ships are now being dealt with. The currents recorded in the logs of H.M. ships between the years 1830 and 1862 will next be taken in hand. The information obtained from these sources is especially valuable as supplying currents near the land, and for parts of the sea seldom traversed by ships of the Mercantile Marine.

Southern Ocean.

Southern Ocean.—The discussion of the meteorological information available for the region from the Cape of Good Hope to New Zealand, referred to in the last Report as the future marine work of the Office, has been commenced. The currents, winds, pressure, and temperature of the air and sea are dealt with, and the occurrence of ice and of whales is noted. The information contained in the Office logs will be supplemented by information

available from any extraneous sources which are likely to be serviceable.

Foreign Stations. Malden Island. *Supply of Instruments to Stations in the Pacific, &c.*—The existing information as to the occurrence of cyclones or other storms in the Pacific is very incomplete, and the want of such information was felt on the occasion of the Samoa cyclone, March 20, 1889. With the view of obtaining further observations, instruments have been supplied on loan to Malden Island, lat. 4° 2′ S., long. 154° 58′ W., and others will be sent shortly to

New Guinea. Port Moresby, in New Guinea. Besides these steps the co-operation of the French Meteorological Department has been solicited in the hope that data may be procured from New Caledonia and the Society Islands.

Houtman's Abrolhos Islands. A meteorological outfit has also been supplied to a station in the Houtman's Abrolhos Islands, in the South Indian Ocean, off Geraldton, in West Australia.

St. Domingo. *Observations at Sanchez, Samaná Bay, St. Domingo.*—The observations made by the late Dr. W. Reid during the years 1886, 1887, and 1888, are now passing through the press, and the volume will appear shortly.

Stock of Instruments belonging to the Office. *Supply and Stock of Instruments.*—In Appendix IV. (p. 69) is given a list of the meteorological instruments supplied by the Office to ships in the Royal Navy during the year, with a statement for the 31st March 1890 of the stock and distribution of the instruments standing on the books to the account of the Admiralty.

Appendix V. (p. 70) gives similar information with regard to the disposal of the other instruments belonging to the Office, remaining in store, or which have been supplied to the Mercantile Marine, observatories, telegraph offices, &c.

PART II.

Weather Telegraphy and Forecasts.

Administrative. There have been no serious interruptions of telegraphic communication during the year.

The following have been the changes in the reporting stations and staff:—The station at Barrow-in-Furness has been discontinued since the end of 1889; at Dungeness, Mr. Batton has succeeded Mr. P. Curnow; and at Scilly, Mr. A. Hicks has been appointed to replace Mr. W. Thomas, who died in March 1890.

A list of the telegraphic reporting stations, British and Foreign, is given in Appendix VI. (p. 71).

The work in this branch of the Office continues to increase. The Daily and Weekly Weather Reports, in particular, have been extended and improved.

Inspection of the Stations. *Inspection of the Telegraphic Reporting Stations.*—The telegraphic reporting stations have been inspected during the year, in England by Mr. Ley, in Scotland by Mr. Buchan, and in Ireland

and Wales by Mr. Scott. The reports submitted by the Inspectors to the Council, which are printed in Appendix VII. (p. 72), show that the efficiency of the service continues to be satisfactorily maintained.

Discussion of the reports.

Discussion and Publication of the Information received.—The practice of the Office in collecting, discussing, and disseminating the meteorological information received by telegraph is described in Appendix VIII. (p. 86). The Daily Weather Report has appeared regularly during the year; for details see Appendix VIII. It is distributed free of cost as follows:—To newspapers, seven copies; to seaports, for public exhibition, 71 copies; to Government offices and public institutions, 66 copies; to correspondents of the Office, 73 copies; and to foreign meteorological establishments, 46 copies. Nearly 200 copies are issued regularly to subscribers.

The Weekly Weather Report, with its Monthly Appendices, has also appeared regularly; for particulars of this publication see Part III., p. 17.

Display of information in front of the Office.

Public display at the Office of the State of the Weather on British Coasts.—With a view to the earliest possible supply to the public of the latest information as to the weather received from the principal points on the coast, the Council have arranged for the display in a conspicuous manner on the front of the Meteorological Office, 63, Victoria Street, of the substance of the reports received by telegraph at 9.30 a.m. and 3 p.m., every week day, of the state of the weather and sea at the following stations: Yarmouth, Dungeness, the Needles (Hurst Castle), Scilly, Holyhead, and Valencia.

Forecasts.

Weather Forecasts.—Forecasts are, as heretofore, prepared three times a day, namely, at 11 a.m., at 3.30 p.m., and 8.30 p.m. The Forecasts prepared at 11 a.m., on the information derived from the 8 a.m. reports, refer to the probable weather between noon on the day of issue and noon on the following day. They are publicly exhibited in several places in London,* and are supplied to the afternoon editions of the newspapers. The 3.30 p.m. Forecasts are employed for storm warnings only, excepting in the hay harvest season, when they are issued as subsequently explained. The forecasts at 8.30 p.m. are specially prepared for publication in the morning newspapers, but all the forecasts are available for the information of anyone who applies for them at the Office.

Inquiries at the Office.

The inquiries received through the Post Office for special forecasts during the year amounted to 52, and the personal applications to 29. The rules of the Office relating to such inquiries are stated in Appendix VIII. (p. 91).

Testing of the Forecasts.

The results of a comparison of the Forecasts issued at 8.30 p.m. during the year, with the weather actually experienced are given

* Viz., in the City, at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's, Cornhill, and Messrs. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and House of Commons; at Messrs. Elliot's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and Messrs. Pastorelli's, New Bond Street.

Results of Forecasts.

in Appendix X. (p. 94). The following summary shows the successes and failures over the whole United Kingdom, estimated as explained in that Appendix. The results were best, 87 per cent., for England South, and worst, 76 per cent., for Scotland West.

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1889–90.

Districts.	Per-centages.				Total per-centage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	50	31	12	7	81
„ E. - -	51	31	12	6	82
ENGLAND, N.E. - -	46	35	12	7	81
„ E. - -	51	32	11	6	83
MIDLAND COUNTIES -	51	29	15	5	80
ENGLAND, S. - -	54	33	10	3	87
SCOTLAND, W. - -	45	31	14	10	76
ENGLAND, N.W. -	48	30	13	9	78
„ S.W. -	51	31	10	8	82
IRELAND, N. - -	48	33	11	8	81
„ S. - -	46	32	12	10	78
Summary - -	49	32	12	7	81

* Note "partial" implies "more than half."

Testing of Forecasts.

The following table shows for each year from 1881 to 1889, inclusive, the per-centages of complete and partial success of the Forecasts issued at 8.30 p.m. for the whole year. Without questioning that improvements may be hoped for as a result of further research, it is doubtful how far greater success is likely to be attained so long as, at present, no information can be obtained concerning atmospheric changes going on over the Atlantic beyond the west coast of Ireland.

PER-CENTAGES of RESULTS of FORECASTS for the whole of the BRITISH ISLES.

Year.	Complete Success.	Partial, *i.e.*, more than Half Success.	Total Success.
1881 - -	34	42	76
1882 - -	43	37	80
1883 - -	48	33	81
1884 - -	50	31	81
1885 - -	50	34	84
1886 - -	49	31	80
1887 - -	52	32	84
1888 - -	51	31	82
1889 - -	49	32	81
Average - -	47	34	81

Hay Harvest Forecasts.—The Council renewed in 1889 the offer made in previous years to the Royal Agricultural Society, the Royal Dublin Society, and the Highland and Agricultural Society to send Daily Forecasts *gratis* during the haymaking season to a number of observers selected by those Societies, on two conditions, viz., that the information should be made known as widely as possible, and that a record of the weather actually experienced should be sent weekly to the Office. The Societies accepted the proposal, and the Forecasts were issued as shown in the following table:— Hay Harvest Forecasts.

LIST of those who received HAY HARVEST FORECASTS in 1889.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass	Golspie.
	Major Smith	Munlochy, Inverness.
1. SCOTLAND, E.	J. Whitton	Glamis, by Forfar.
	G. Murdoch	Rothiemay, Huntly.
	C. L. W. Forbes	Aberfeldy.
2. ENGLAND, N.E.	Sir J. Wilson	Chillingham Barns, Chatton, Northumberland.
	J. Turner	The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck	High House, Thorpe, Norwich.
	Sir J. B. Lawes, Bt., and J. H. Gilbert, Ph.D.	Rothamsted, Harpenden.
	J. Fergusson*	Brettenham Manor, Thetford.
4. MIDLAND COUNTIES	Royal Agricultural College.	Cirencester.
	E. E. Harcourt-Vernon	Grove Hall, East Retford.
5. ENGLAND, S.	C. Whitehead	Barming House, Maidstone.
	E. P. Squarey	The Moot, Downton, Wilts.
	G. M. Allender	Stammerham, Horsham.
	M. J. Sutton	Reading.
6. SCOTLAND, W.	W. Calder	Castle Hill, Dalreoch, Dumbarton.
	M. J. Stewart, M.P.	Ardwell, Stranraer.
	J. S. R. Ballingal	Eallabus House, Islay.
7. ENGLAND, N.W.	G. W. Wray	Leyburn, Yorkshire.
	The Earl of Derby, K.G.	Knowsley Hall, Prescot.
8. ENGLAND, S.W.	Colonel J. B. Turbervill	Ewenny Priory, Bridgend, Glamorganshire.
	The Earl of Ducie	Tortworth, Gloucestershire.
	T. Dyke	Long Ashton, Clifton, Bristol.
	R. Neville Grenville	Butleigh Court, Glastonbury.
9. IRELAND, N.	E. F. Farrell	Moynalty, Co. Meath.
10. IRELAND, S.	D. A. M'Cready	Larchvale, Moneygall, King's Co.
	D. A. Milward	Lavistown, Kilkenny.
	W. Talbot Crosbie, D.L.	Ardfert Abbey, Tralee, Co. Kerry.

* Mr. Fergusson is a subscriber for these Forecasts.

Hay Harvest Forecasts.

The issue of the forecasts commenced on June 11th with those for the South and East of England, and were continued for about five weeks, ending on the 3rd of August over the greater part of Scotland, and a week later in Ireland.

The general result of the issue of these forecasts, shown by the subjoined table, has been prepared solely from the reports of the above-mentioned gentlemen, and is entirely independent of any estimate formed within the Office itself:—

SUMMARY of RESULTS.—HAY HARVEST FORECASTS, 1889.

Districts.	Names of Stations.	Percentages.				Total percentage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N. -	Munlochy and Golspie - - -	57	33	10	—	90
„ E. -	Aberfeldy, Rothiemay, and Glamis -	51	31	13	5	82
ENGLAND, N.E. -	Chatton and Ulceby - - -	67	26	7	—	93
„ E. -	Rothamsted, Thorpe, and Thetford -	64	29	7	—	93
MIDLAND COUNTIES	Cirencester and East Retford - -	61	34	3	2	95
ENGLAND, S. - -	Downton, Horsham, Maidstone, and Reading.	60	30	10	—	90
SCOTLAND, W. -	Stranraer, Islay, and Dumbarton -	52	30	14	4	82
ENGLAND, N.W. -	Leyburn and Prescot - - -	53	30	12	5	83
„ S.W. -	Tortworth (Gloucestershire), Clifton, Bridgend (Glamorganshire), and Glastonbury.	50	40	9	1	90
IRELAND, N. - -	Moynalty - - - - -	50	40	7	3	90
„ S. - -	Moneygall, Kilkenny, and Tralee -	56	29	10	5	85
	Mean for all districts, 1889 - -	57	32	9	2	89
	„ „ 1888 - -	49	35	11	5	84

These figures show that the forecasts for 1889 were five per cent. better than those for 1888, and indicate the highest proportion of success that has ever been reached.

The largest general per-centage (95) was attained in the Midland Counties, and the lowest (82) was in Scotland East and West.

Major Smith and Messrs. Birkbeck, Fergusson, Squarey, and Sutton all gave independent testimony to the correctness of the forecasts.

In addition to the above, telegrams were sent to several other gentlemen at their own cost.

The funds at the disposal of the Council will not admit of extensive gratuitous distribution of Hay Harvest Forecasts, but now that the Board of Agriculture has been organised, the Council propose in the course of the current year again to suggest the advisability of a wider distribution of these Forecasts, their former reference to the Privy Council on the subject having led to no result.

Supply of Forecasts to the Fleet during the Manœuvres.—At the request of the Admiralty daily forecasts were supplied to the Commander-in-Chief of the "A" Fleet during the continuance of the Manœuvres in 1888 and 1889.

Information as to Forecasts supplied to the United States.—In the month of April 1889 inquiries as to the practice of the Office

in the preparation and issue of forecasts were received from the Chief Signal Office, Washington, and the Council furnished replies. The correspondence will be found in Appendix IX., p. 92.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix XI. (p. 95) are given the names of the stations furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade issued in February 1874. Storm warnings.

These stations were, at the end of March 1890, 153 in number, situated:—

72 in England, 16 in Wales, 44 in Scotland, 15 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

With a view of adding to the efficiency of these warnings a revision of the districts in which the stations are arranged has been made, and further measures will be taken to improve the record of storms on the coasts by means of which the utility of the warnings will be better checked.

A comparison has been made in the Office between the warnings issued in 1889 and the weather experienced on our coasts, the warnings being tested by the method explained in Appendix VIII. (p. 92). The results of this comparison are shown in the following tables:—

RETURN of the RESULT of the COMPARISON between the WARNINGS ISSUED and the WEATHER EXPERIENCED in 1889.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 and 7.	Warnings not justified by subsequent Weather.	Warnings late. Force 9 reached at two Stations before issue.	Warnings partially late. Force 9 reached at one Station before issue.	Warnings in Error owing to telegraphic mistakes.	Storms for which no Warning was issued.
Ireland, South -	43	24	12	5	1	1	—	Feb. 2–3.
„ East -	44	13	20	11	—	—	—	Feb. 2–3.
Scotland, East -	39	25	9	5	—	—	—	Jan. 18, Feb. 2–3. Mar. 26*, Sept. 28.
„ West -	39	16	15	8	—	—	—	Feb. 2–3.
England, North-west	42	25	11	6	—	—	—	Feb. 2–3, Mar. 26, Sept. 28, Nov. 15.
„ West -	37	14	18	5	—	—	—	Feb. 2–3, Nov. 25.
„ South-west	36	18	14	2	1	1	—	—
„ South -	30	19	8	2	—	1	—	Nov. 25.
„ South-east	28	11	11	5	—	1	—	Nov. 25.
„ East -	35	13	7	14	—	1	—	—
Totals - -	373	178	125	63	2	5	—	
Per-centages -	—	47·7	33·5	16·9	0·5	1·4	—	

* These gales were felt only to the northward of Aberdeen.

NOTES as to GALES in 1889 for which WARNINGS were not issued.

Jan. 18th.—A brief but severe gale from westward, felt in Caithness and the Shetlands. Apparently caused by a small depression of which we could have no knowledge, but secondary

Notes as to gales for which warnings were not issued.

to a larger system situated over Lapland. Gale confined to extreme northern stations.

Feb. 2–3.—A severe and wide-spread gale from west to north-west, caused by a large and deep depression which on Feb. 1 appeared to be moving eastwards towards Norway. At 6 p.m., 1st, barometer had begun to rise in Ireland as though the worst was past, but in the following night the storm suddenly took a southerly course, and passing quickly down our eastern coast, caused the gales mentioned. At 8 a.m., 2nd, it was too late to hoist any signals.

March 26th.—Fresh to strong north-westerly gale in north and east of Scotland, caused by small depression advancing suddenly from north-westward early on 26th, in rear of, and secondary to, a larger system which had moved from the Shetlands towards Norway. By 8 a.m., 26th, it was too late to hoist any warning signals.

Sept. 28th.—North-westerly gale in north of Scotland and north-west England. At 8 a.m., 28th, a depression lay off the west of Norway, and appeared to be moving south-eastwards. Subsequently it took a much more southerly course, while pressure actually increased on our western coasts; a gale was thus produced, without being expected. At 8 a.m., 29th, centre of depression was over Holstein.

Nov. 25th.—Strong south-westerly gale on western, southern, and south-eastern coasts of Great Britain, caused by a depression which lay over Ireland at 6 p.m., 24th. Of the depth of this disturbance we had no knowledge owing to insufficient information, the 24th being a Sunday. Available reports showed only a "V"-shaped system of moderate intensity, but the Parsonstown report next morning showed that the "V" contained a well-formed disturbance which caused the gales referred to.

Comparison of results for 1889 with previous years.

The following table contains a comparative statement of the storm warnings and their results in 1889, and in the ten preceding years. It will be seen that the total per-centage of warnings justified is 81·2, being 2·7 less than that for the preceding year:—

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
		p.c.	p.c.	p.c.	p.c.
1879	509	50·5	25·1	75·6	20·6
1880	390	58·2	24·6	82·8	13·3
1881	454	58·6	23·3	81·9	14·8
1882	503	61·4	21·1	82·5	14·9
1883	610	56·2	21·6	77·8	20·8
1884	461	66·4	20·0	86·4	12·1
1885	591	55·3	24·0	79·3	19·5
1886	542	55·3	26·9	82·2	15·9
1887	472	55·5	26·1	81·6	16·4
1888	539	55·3	28·6	83·9	14·3
1889	373	47·7	33·5	81·2	16·9

The Washington Maritime Conference.—A proposal to introduce international uniformity in the existing systems of Storm Warnings in various countries was included in the Programme for this Conference, and in the month of November the Council were consulted by the Board of Trade as to the representation of this country at Washington by a special delegate with reference to this question. The reply of the Council was not favourable to the nomination of such a delegate. The correspondence will be found at Appendix XII., p. 97. Washington Maritime Conference.

Proposal for a Meteorological Station at Bermuda.—In the month of July an inquiry was received from the Board of Trade, as to the probable cost of the maintenance of a telegraphic reporting station at Bermuda. The Council, in their reply, strongly supported the establishment of such a station, and stated that the cost of such stations in these islands was very moderate. The correspondence will be found at Appendix XIII.. p. 99. Proposed station at Bermuda.

Fishery Barometers.—To add to the means of obtaining warnings of stormy weather by the sea-going population, barometers were many years ago supplied by the Board of Trade on loan to fishing villages and other places on the coast, to be set up for public information. The whole number of stations supplied by the Office with these instruments is 177. Of these 59 are in England, 6 in Wales, 49 in Ireland, 59 in Scotland, 3 in the Isle of Man, and 1 in Jersey. The list is given in Appendix XIV., p. 102. Fishery barometers.

The inspection of the Fishery Barometers in England and Ireland has been continued during the past summer, the Hon. R. Abercromby taking the east of England, while Captain Toynbee visited the north of Ireland, from Donegal Bay round to Dundalk.

In almost all cases the instruments were found to be in good order, and they seemed to be valued by the fishermen in each locality. Whenever possible, the opportunity of the inspection was taken to impart instruction in the use of instruments in connexion with weather observations.

Simultaneous Observations.—The Office has continued its co-operation in the system of International simultaneous observations, taken at Greenwich mean noon, as explained in former Reports, which was organised in 1874, at the request of the Chief Signal Officer of the United States. Simultaneous observations.

The number of these observations which have been received during the year from the Royal Navy has been 3,880, and from the Mercantile Marine, 6,300.

PART III.

Land Meteorology of the British Isles.

Observatories and Stations.—The observations of the climate of the British Isles, which are received by the Office from certain

stations, may be arranged in five classes, according to the degree of completeness with which they are made.

Self-recording observatories.

1. The Observatories furnished with self-registering instruments by which all the principal meteorological phenomena are recorded continuously. These alone afford the materials necessary for the study of the periodic variations of the meteorological elements.

Anemographic stations.

2. Anemographic stations furnished with instruments registering the wind only. The records from these stations relate rather to weather as distinguished from climate, and are especially important in connexion with storms. They are often useful in affording evidence available in courts of law with respect to collisions at sea, and damage done by wind.

Stations of Second Order.

3. Stations of the Second Order furnishing climatological information from eye observations taken twice a day. The observers at these stations are all volunteers.

Telegraphic Reporting Stations.

4. The Telegraphic Reporting Stations, at which the observations are taken by eye, but supplemented in some cases by self-recording aneroids, &c., supply the material upon which the daily weather reports and forecasts are based. The hours of observation at these stations are determined by the requirements of the telegraphic system, as explained in Part II., but the data which they furnish are also utilized to afford climatological information for parts of the country where Stations of the Second Order do not exist.

Extra stations.

5. Extra stations furnishing returns with less completeness and detail than those of Class 3.

Sunshine stations.

A continuous record of the amount of bright sunshine is received from 39 stations in the British Isles, of which some are first or second order stations, whilst from others the sunshine record is alone received. See Appendix XV., p. 103.

A fuller account of these several stations and of the methods employed by the Office in dealing with their records will be found in Appendix XVI., p. 104.

Documents received.

Appendix XVII., p. 108, contains a list of all documents relating to the land meteorology of the British Isles received at the Office during the year.

Regulation of Observatory work.

Regulation of Work at principal Observatories.—The regulations for the management of the self-recording instruments have been carefully revised. They will be found in Note A., p. 24. The experience of nearly 20 years has shown that in all essentials the instruments are thoroughly satisfactory, and that very little alteration was required in the instructions originally issued for their use, which are contained in the Report of the Office for 1868.

Inspection of Stations.

Inspection of the Stations.—The self-recording observatories and the anemographic stations (Classes 1 and 2), as well as the Telegraphic Reporting Stations (Class 4), are regularly visited each year by the Inspectors of the Office. The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 3), some belong to the Royal Meteorological Society; these are visited by an Inspector appointed by that Society, an allowance being made by the Office toward the cost of the

inspection, in accordance with the recommendation of the Treasury Committee (1877); and some belong to the Scottish Meteorological Society. The remaining Stations of the Second Order are visited at least once in every two years by the Inspectors of the Office. The Superintendent of the Kew Observatory, Mr. G. M. Whipple, and his chief assistant, Mr. T. W. Baker, are specially employed to inspect and report on the self-registering apparatus, and on the photographic processes at the observatories. Extracts from the Reports of the Inspectors are given in Appendix VII., p. 72. Inspection of stations.

Information supplied to the General Register Office, Dublin.—Reports from eleven of the Irish stations of the Office have been regularly supplied to the Registrar General for Ireland, for his Weekly and Quarterly Returns. Reports supplied to Registrar General for Ireland.

Quarterly Weather Report.—Part I. of the volume for 1880 has been issued, and Part II. is in the press. On the final completion of this volume the issue of the Quarterly Weather Report with the reproduction of the continuous records from the seven observatories, comes to an end. Publications.

The following is a list of the volumes which have already appeared or are in process of issue, with the dates of their publication:—

Quarterly Weather Reports.

Year.	Published.	Year.	Published.
1869 - - -	1871	1875 - - -	1879
1870 - - -	1872	1876 - - -	1884
1871 - - -	1874	1877 - - -	1885
1872 - - -	1873	1878 - - -	1887
1873 - - -	1875	1879 - - -	1889
1874 - - -	1877	1880* - - -	—

* In progress, Parts III. and IV. still to appear.

In place of this publication there have been successively issued, first, the Monthly Weather Report, and subsequently, the Monthly Summary of the Weekly Weather Report.

Other Periodical Reports.

Monthly Weather Report, 1884–1887 (January to August), published; 1881–1883 and 1887 (September to December), still to appear.

This publication ceases with the year 1887, and the information it supplied is now given in the Monthly Summary of the Weekly Weather Report.

The Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office (see Appendix VIII., p. 88), has been considerably modified in form, with a large saving of expense, and now supplies, by its synchronous charts, a very complete and instructive view of the chief meteorological changes, day by day, over the greater part of Europe, such as is not to be found in any of the similar publications issued by any other office.

Publications.

A Monthly Summary, replacing the former Monthly Weather Report, appears as a supplement to the Weekly Weather Report.

Appendix I. to the Weekly Weather Report for 1889 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature for each district, for the 24 years 1866–1889, and also the Monthly and Progressive values of Accumulated Heat, Rainfall, and Bright Sunshine for all the districts in each month of 1889. Appendix II. to the same Report gives the Weekly and Progressive values for the same elements during the year 1889 (in continuation of Appendix II. for the year 1888), and Appendix III. gives the Mean Weekly values for the following number of years:—

Accumulated Heat and Rainfall, 11 years, 1878 to 1889.
Bright Sunshine - - 8 „ 1881 „ 1889.

Appendix IV. gives for each district, for the 12 years 1878 to 1889, the mean temperature for each week in the year.

Hourly Readings.—After full consideration the Council have resolved to make a very considerable alteration in the form of publication of the *Hourly Readings* obtained from the records of the self-registering instruments at the four principal observatories, and to commence the new series with the year 1887. The calculations for that year are in an advanced stage, and will shortly be ready for press. In future the publication will consist of a carefully arranged series of mean values, which it is believed will prove more generally useful than the publication of the hourly readings *in extenso*, which has hitherto taken place. The new series will comprise—

(1.) *Hourly* means of pressure, temperature, the difference between the dry and wet bulbs, and of wind components, together with the amount and frequency of rain; these hourly means will be for periods of (*a*) five days, (*b*) calendar months, and (*c*) the year.

From these will be computed the harmonic components of the hourly and yearly mean variations of pressure and temperature for each month and for the year.

(2) The daily, five-daily, monthly, and yearly means of pressure and temperature.

(3.) The monthly and annual falls of rain will be given as heretofore.

(4.) The wind results will be given in the form of mean components, referred to the four cardinal points, the Council considering this to afford upon the whole the best solution, although by no means an altogether satisfactory one, of the difficult problem of dealing with the mean direction of the wind.

The computation of mean hourly values of the temperature of the air and of barometrical pressure for the seven observatories and for each month of the year 1883 has been completed, and the Council has decided to extend the work to all those years preceding 1883 for which data exist and which have not already

been dealt with, and considerable progress has been made with the work. Publications.

Observations at Stations of the Second Order.—The volume for 1885 has appeared, and that for 1886 is in an advanced state.

The number of stations, 32, from which the returns have been of late years published *in extenso* has been considerably in excess of the number, 15, proposed by the Congress of Rome in 1879, and the Council has therefore resolved to reduce the present number to 21, which they consider to be sufficient, while it will considerably diminish the cost of the publication. At the same time the number of stations from which monthly means and summaries only are published in a concise form, has been increased from 14 to 45.

The following is the list of stations for which returns will be published for 1886 and future years:—

STATIONS for PUBLICATION in DETAIL on Form A., 21 in Number.

Stations.	In connexion with	Years already published in detail.	Remarks.
Glasgow	M. O.	10	Formerly observatories. 10 years hourly readings already published.
Stonyhurst	M. O.	12	Continuous records of pressure, temperature, wind, and rainfall still available, except for Armagh, which furnishes wind and rain only. For Stonyhurst and Armagh the records for 1884 and 1885 have been published among the stations on Form A.
Armagh	M. O.	12	
Dunrobin Castle	S. Met. Soc.	6	
Braemar	S. Met. Soc.	6	High-level station (1,113 feet).
Dundee	S. Met. Soc.	6	
Wolfelee	S. Met. Soc.	—	
Scarborough	R. Met. Soc.	5	
Hillington	R. Met. Soc.	9	
Churchstoke	R. Met. Soc.	10	Sutton Coldfield to be substituted for Churchstoke for 1889.
Carmarthen	R. Met. Soc.	11	
Margate	R. Met. Soc.	4	
Dartmoor (Princetown).	R. Met. Soc.	7	High-level station, 1,395 feet. The only high-level station available in the south of England.
Swanbister	M. O.	—	This is the most northern station available, and there is a continuous record of wind.
Laudale	M. O.	7	
Douglas (Isle of Man).	M. O.	8	
Southampton	M. O.	8	At both of these stations there are long series of observations available taken by the officers of the Ordnance Survey.
Dublin (Mountjoy Observatory).	M. O.	—	
Markree Castle	M. O.	11	
Parsonstown	M. O.	13	
Londonderry	M. O.	7	

List for Publication on Form B. (Monthly Means and Summaries).

Swanbister.
S Lairg.
S Dunrobin Castle.
S Gordon Castle.
S Glencarron.
Aberdeen.
S Fort Augustus.
S Braemar.
S Fort William.
S Lednathie.
Laudale (Argyleshire).
S Dundee.
S Ochtertyre.
S Callton Mor.
Glasgow.
S Rosewell.
S Rothesay (Isle of Bute).
S Marchmont.
S Wolfelee.
S Pinmore (Ayrshire).
S Glenlee.
M Cramlington.
S Cargen.
M Scaleby (near Carlisle).
Durham.
Newton Reigny.
Aysgarth (Yorkshire).
M Scarborough.
Cronkbourne (Douglas), Isle of Man.
York.
Stonyhurst.
M Wakefield.
Prestwich.
M Llandudno.
M Buxton.
M Cheadle.
M Hillington (Norfolk).
Leicester.
Uppingham.
M Churchstoke (Montgomeryshire).
Geldeston (Beccles).
M Bennington.
M Cheltenham.
St. David's.
M Carmarthen.
M Berkhamsted.
Kew.
M Margate.
Southampton (Ordnance Survey Office).
St. Leonard's.
M Southbourne.
M Rousdon.
M Dartmoor.
M Babbacombe (Torquay).
Falmouth.
Londonderry.
S Lissan (Co. Tyrone).
Armagh.
Brookeborough (Colebrooke Park).
Markree Castle (Sligo).
Dublin (Glasnevin).
Dublin (Mountjoy Observatory, Phœnix Park).
Dublin (City).
Parsonstown (Birr Castle).
M Killarney.
Valencia.

The Stations marked S belong to the Scottish, and those marked M to the Royal Meteorological Society.

Observations on Ben Nevis.

Observations on Ben Nevis.—The arrangements made with the Directors of the Observatory on the summit of Ben Nevis, at a height of 4,406 feet above the sea, and explained in the Report for 1885, remain in force, and the Council have continued the annual grant of 100*l.* towards the expenses of the Observatory, and have received MS. copies of all the meteorological observations taken.

The building of the new observatory at Fort William is now completed. It was explained in the last Report that the Council had agreed to subsidize this observatory to the extent of 250*l.* a year, and supply it with the necessary outfit of instruments. These will shortly be sent down and erected.

Sea Surface Temperature.

Sea Surface Temperature on the Coasts of the British Isles.—These observations, which are obtained through the courteous assistance of the Admiral Superintendent of Naval Reserves, the Trinity House, and the Commissioners of Irish Lights, are still continued, and a large amount of valuable information is thereby collected.

Cloud Photography.

Cloud Photography and Measurement.—This subject has continued to receive attention, but as yet satisfactory results have not been obtained.

The Bridled Anemometer.—The experiments with the bridled anemometer, an instrument intended to record strong gusts of wind, which have been undertaken by Mr. W. H. Dines, as intimated in the last Report, have been continued, and the result has been to show that the cups, placed in the same plane, at the ends of short arms, exercised appreciable interference on each other. The anemometer will be altered to remedy this defect. Further experiments have also been carried on by Mr. Dines at Hersham with respect to other questions relating to wind. An account of these will be found at Note B., p. 36. The Bridled Anemometer.

Electrical Anemometer.—This instrument has now been erected at Kew for the purpose of ascertaining whether its indications can be utilized. The results hitherto have not been satisfactory. Electrical Anemometer.

Violle's Actinometers.—At the request of the Solar Physics Committee the Council have undertaken to institute some experiments at Kew Observatory on Violle's apparatus for measuring solar radiation. (Note C., p. 46.) Violle's Actinometer.

The Harmonic Analyser.—The analysis by this instrument of the barograms from the seven observatories has now been completed for the 12 years 1871–1882 inclusive. The corresponding results obtained from the thermograms were published in 1886. The Harmonic Analyser.

In consequence of the resolution of the Council to undertake the calculation of the mean hourly values of pressure and temperature, the question arose whether the harmonic constants might not be obtained in a more complete and satisfactory manner by arithmetical computation than by the mechanical process. The Council therefore thought it advisable to ascertain as far as possible what was the degree of accuracy obtainable by the use of the machine, and what were the causes of error likely to arise.

For this purpose a series of experiments has been carried out, more complete than those before made, the result of which has been to show that, owing to certain difficulties which are experienced in passing the curves through the machine, and which could not be avoided without making a very considerable alteration in the mechanical details of one portion of the instrument, the results obtained by a mechanical analysis of the curves are liable to errors which, though small in themselves, are important in relation to the quantities being dealt with, which are themselves very small.

From this and other considerations, and from the character and results of the experiments upon the operation of the machine which will be found in fuller detail in Note D., p. 47, the Council have resolved to obtain the harmonic coefficients by arithmetical computation in preference to the use of the machine, though the machine may for certain purposes be found very useful.

Thermometers for Cotton Cloth Factories.—The Cotton Cloth Factories Act, 1880, states that in every such factory there shall be provided, maintained, and kept in correct working order two sets of "standardised" wet and dry-bulb thermometers. In the Thermometers for Cotton Cloth Factories.

Thermometers for Cotton Cloth Factories.

month of January the Council were requested by the Home Office to inform the Secretary of State how thermometers had best be "standardised" for the purposes of the Act. The Council replied that thermometers were at present being verified at the Kew Observatory of the Royal Society to the extent of several thousands annually, and that accordingly the testing of such instruments presented no difficulty.

Records from stations of the Royal Engineer and Army Medical Departments.

Observations from Military Stations.—The summaries of these observations, made under the direction of the Royal Engineer and Army Medical Departments, between 1852 and 1886, have been completed, and the volume has now been issued.

Trevandrum Observations.

Trevandrum Observations.—On the death of Mr. J. Allan Broun, F.R.S., in 1879, the desirability of discussing and publishing the records of the observatory at Trevandrum, in Southern India, which had been carried on under his superintendence for over twelve years, was brought before the Royal Society of London by the Royal Society of Edinburgh. The whole of the records, 31 volumes, were subsequently (in 1880) deposited at the Meteorological Office, by Mrs. Broun, for safe keeping. The negotiations on the subject with the Indian Meteorological Department at that time led to no result. The Meteorological Council have now resolved to make another effort to induce the Indian Authorities to render the very valuable material contained in these MSS. accessible to scientific men, and have addressed the Royal Society on the subject.

Library.

Library.

The library contains standard works on Meteorology and the allied Sciences, and is, besides, particularly rich in Transactions, Proceedings, Reports, and other Publications which give a large mass of Meteorological observational data from all parts of the world, extending over many years. It consists at present of over 11,000 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men for reference at the Office.

Appendix XVIII., p. 113, contains a list of the additions to the library during the year, which have been catalogued upon cards, and are entered in the reference catalogues under (1) Authors, and (2) Subjects.

Expenditure.

Financial.

Appendix XIX., p. 138, shows the receipts and payments during the year ending 31st March 1890. The amount voted by Parliament was 15,300*l.*, as in the previous year.

The following abstract of expenditure shows the amount properly chargeable to the year in question, and its distribution under the

various heads, together with the increase or decrease in 1889–90, as compared with the previous year :—

Net Expenditure.	1888-89.	1889-90.	Increase.	Decrease.
General Administration:	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Payment of Council -	1,000 0 0	955 18 4	—	44 1 8
Secretary - -	800 0 0	800 0 0	—	—
Office - - -	798 8 0	801 4 2	2 16 2	—
Rent, fuel, and lighting -	709 17 11	701 14 3	—	8 3 8
Alterations to premises, attendance, and contingencies - -	436 4 0	474 7 6	38 3 6	—
Expenses incidental to International Meteorological Congress -	22 2 3	5 2 0	—	17 0 3
Pensions - -	138 16 4	186 16 4	48 0 0	—
Special Researches -	570 5 0	710 10 6	140 5 6	—
Land Meteorology -	3,353 7 1	3,544 9 11	191 2 10	—
Weather Information -	3,845 10 4	3,777 19 5	—	67 10 11
Inspections - - -	702 5 1	664 2 5	—	38 2 8
Ocean Meteorology -	2,795 3 3	2,736 9 4	—	58 13 11
Total - - £	15,171 19 3	15,358 14 2	420 8 0	233 11 3

In the year 1889-90 the sum of 1,606*l.* 9*s.* 5*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, and rental of private wires.

(Signed) R. STRACHEY,
Chairman.

NOTE A.

CODE of REGULATIONS, &c., &c., for conducting the WORK at the FIRST-CLASS OBSERVATORIES, and the EXAMINATION thereof.—1889.

THE errors to which the traces derived from self-recording meteorological instruments, and the numerical values obtained from them, are subject, are of three classes, viz.:—

i. Errors in the traces themselves, including those due to faulty attachment of the paper upon which the curves are produced.
ii. Errors of date and time-scale entered upon the papers.
iii. Errors in tabulating from the traces.

Errors in the Traces themselves.

With a view of avoiding, as much as possible, errors included in the first category, the attention of observers in charge of instruments is directed to the following points:—

Care must be taken that the gas flames in the instruments are so adjusted, and the condensers and reflectors so fixed, that the barometer tube and two thermometer tubes with their attached shields are at all times well illuminated.

In the event of a very exceptional rise or fall of pressure or temperature, and when the observer has reason to fear that readings will otherwise be lost, the instrument should be temporarily raised or lowered by means of the screw, so that the record of extreme values may be secured.

But as any alteration of the positions of the instruments, especially of the barometer, throws out the zero of the scales, this measure should only be adopted with extreme caution.

In all cases when changes in the positions of the instruments are made, careful eye observations should be made before and after each change, to guard the records from the effects of erroneous index errors, or errors of zero lines.

In the case of the barometer the instrument should be carefully restored to its original position as soon as the occasion for the change has passed away.

The thermometers, however, must be regularly raised and lowered by the screw suspending them, in the course of every year, in order to secure sufficient illumination for the portion of the scale likely to be in use in summer and winter respectively: and care must be taken not to postpone this operation in spring and autumn until some of the readings have been lost.

Great care should be taken that all the parts of the instruments are working correctly, and are free from dust.

Before wrapping the photographic paper round the cylinders it should be carefully examined as to the freedom from blemishes or defective coating of the sensitive surface, and when fixed in its

place on the cylinder a second examination should be made to see that while it is everywhere in close contact with the cylinder, there is no bagging or bulging, and that its edge is parallel to the edge of the cylinder nearest to the trace. Care should also be taken in cutting off the superfluous paper, that no loose ends are left projecting, as they are liable to cause a stoppage of the clock.

The prepared papers for use with the anemograph and rain-gauge require similar precautions to be taken with regard to wrapping them upon the cylinders; but additional care is also required, so that the lines ruled upon these papers are made to coincide with certain points of the apparatus designed for the purpose of properly setting the instruments.

After placing a new sheet of prepared paper on the cylinder of the rain-gauge, the glass tabulating scale should be used to see that the printed scale on the paper is parallel with the edge of the cylinder. The height of the pencil is next adjusted so that, the bottle being empty, the trace runs along the zero line of the blank paper, when the cylinder is turned by hand.

The float is also to be depressed by the finger and allowed to rise again in order to see that it is free to act throughout its whole range.

Great care should be exercised to avoid interfering with the instruments or their positions, but when any alteration of position, or interference with, or interruption of, their action occurs, an explanatory note of the causes of all deficiences should be made on the curves and tabulations.

Errors of Time and Date.

Observers should set their watches daily to correct G.M.T., either by reference to a standard clock, or to a chronometer corrected to the true time for the day by means of a table of going rates. The instrumental clocks should all be set to this correct time at the time of changing the papers, and comparisons should be made at every observation hour in order to see that no stoppage has occurred in the interval which has elapsed between the observations.

In the case of the photographic instruments, after changing the papers, the observer should, if possible, listen for the sounds produced by the closing and opening of the light shutter, which will show that it is duly performing its duty.

The error of the instrument clocks should never be allowed to exceed two minutes in the two days.

The instrumental clocks should all be wound daily between the hours of 10 and 11 a.m., fresh papers being placed daily on the cylinders of the anemograph and rain-gauge, and on alternate days on the barograph and thermograph. The observer should carefully note the exact time at which the clocks are stopped or the cylinders detached from the driving gear, and should also read the indications of the dials and time-scales, noting them down at

the time on the journals, and on the reverse sides of the anemograph sheets. Similar memoranda should also be jotted down of the time at which the instruments are again set in action. The photographic sheets to be marked with the initials B_1, B_2, and T_1, T_2, in addition to the date, as a guide to the photographer in his operations, the sheets marked B_1 T_1 being the outer.

As soon afterwards as time permits, the dates should be permanently and distinctly written up in ink, the time-scales, &c. stencilled on, and the clock times and check standard readings entered on the sheet in accordance with the regulation pattern.

The wet bulb thermogram should be examined for places where the damping was inefficiently performed, and remarks made accordingly.

Check observations of the standard thermometers and barometer should be made five times daily; those of the thermometers at the moment coincident with the shutting off the light from the curve at two minutes before the even hour, and those of the barometer when the light is restored at two minutes after the even hour.

General Instructions.

WET-BULBS:—At the times of reading the standard thermometers the state of the wet-bulbs of both the standard and self-recording instruments ought to receive attention. If both bulbs seem to be properly wetted, and sufficient water is in the cistern to maintain them in the same condition until the next visit of the observer, the sign ✓ should follow the entry of the standard reading in the observation book and journal. If either of the bulbs is wholly or partially dry at the time of observation, a note should be made to call the attention of the tabulator to the unsatisfactory nature of the observation at that hour, and the observer should proceed to damp the thermometer at once.

In time of frost the bulbs should be kept covered, if possible, with a thin coating of ice by applying, at frequent intervals, a little cold water directly to the surface of the bulb. When the air is too moist to allow of this ice jacket evaporating or the temperature is at or about the freezing point, and the ice does not melt off the bulb quickly enough, it should be melted off by using a little warm water. This may also serve to thaw the ice in the supply tank, tubes, and threads, which might otherwise fail to act properly.

In hot and dry weather it is sometimes found that difficulty occurs in maintaining the wet-bulbs in a properly moistened condition. In such cases the tank should be refilled at more frequent intervals than usual, and also new threads and muslin should be fitted up. It is necessary to soak well, or boil in water, the threads and muslin before they are used, in order to remove from them any gum or starch, the presence of which seriously reduces the capillary actions.

The water supplied to the wet-bulb cistern should, if possible, be rain water, and always be taken from a vessel exposed to the

air, so that its temperature may be that of the air, this being of importance. The best plan is to save and use the water collected from the rain-gauge as being free from lime, which in the case of hard water forms an incrustation on the muslin; when this is observed the muslin should be changed.

Flooding from excess of water often occurs when the cistern is refilled, vitiating the record for a quarter of an hour or more after replenishing.

The water cistern should, as a rule, be filled after reading the thermometers; and it is advisable to restrain the flow of water so that no more runs over the bulb than is requisite to keep it completely moistened. The lowest points of the thread should always be somewhat lower than the *points of attachment* of the thread to the thermometer bulb, so that the water rises to the bulb by capillary attraction. Notes of the times of adding water must be made on the curves.

ANEMOGRAPH:—Once a month, on a calm day, the orientation of the anemograph should be tested in order to see that the direction of the wind is being properly recorded, and that no slipping has taken place in any of the joints of the shafting. Opportunity should also be taken of this, to oil the instrument thoroughly, and to see that the bearings are free from dirt.

Full details as to how this is to be performed are given in a special circular of instruction which was issued in March, 1882.

RAIN GAUGE:—As regards the rain-gauge, particular care must be taken to change the recording papers every day at about the hour of 10 a.m.; the observer must never assume absence of rain in the 24 hours, as a shower may fall unnoticed during the night.

At the time of changing the rain-gauge papers the observer should always empty the contents of the receiver into the measuring glass, and compare the amount so measured with that indicated at the time by the curve, recording on the sheet the sum of the discharges *plus* the quantity so measured.

The measurement of snow by this gauge does not give very satisfactory results. Probably the best method is to collect the snow contained in the receiver into a vessel, and having melted it, to pour the water through the gauge in order to show the trace. In such cases the measurement of the hourly values should not be attempted, but the total amount entered at the latest hour to which the trace extends.

A spare gauge of the 8-inch pattern should be kept in the close vicinity of the Beckley gauge, and its contents measured immediately after the latter has been seen to.

Any material discrepancy between the indications of the two instruments should be noted in the weather journal, and endeavours made to ascertain its cause.

SUNSHINE RECORDER:—The cards are to be changed if possible at sunset each day, or if this is inconvenient, at some

other fixed hour, which having been chosen, is to be adhered to as closely as possible.

The card is to be changed even if it has not been scored, and the identical card which was in the instrument returned to the Meteorological Office.

If the weather be windy it is advisable to insert a small wedge of paper so as to hold the card firmly in its groove.

In time of snow, when there is any chance of sunshine, the snow should be removed from the ball and from between the ball and the card. Hoar frost should also be removed from the ball as soon as possible, and the ball should occasionally be wiped to remove any dirt which may have become deposited upon it.

Every card should have clearly written upon it the name of the observatory, the date, and the time of insertion and withdrawal, using local apparent time; this is especially important if the cards are changed while the sun is shining. Should the instrument have been moved, or should anything have occurred to interfere with the accuracy of the score in any way, an explanatory note should always be written on the back of the card.

The cards are to be returned to the office as soon as possible after the close of each month. In packing them for transmission through the post they should always be kept flat and never be folded.

Further particulars as to the setting of the instrument, obtaining local apparent time, &c. will be found in a special circular issued January 1889, entitled "Directions for adjusting and using the Sunshine Recorder."

Tabulation of traces and discovery of Errors.

Tabulation forms are provided for the entry of the measurements made from the automatic traces. These have to be suitably prepared for use by having written upon each of them on every page the name of the observatory and a consecutive number corresponding with that given in the diary issued by the Meteorological Office for each year. The dates are next entered, care being taken that they accord with the entries in the diary and journals, and also that each month's work is kept totally distinct from any other. New forms throughout should be brought into use on the first day of every month.

Barograms.—The curve being duly written up and dated, is fixed in the tabulator frame and the scale fitted, the brass time-scale being adjusted so that the measuring bar-catch accords with the time gaps on the barograph curve indicating the even hours, in order that the reading glasses may be properly placed for the *odd* hours, not so indicated.

The reading glasses—the upper being set so that when the zero of the scale corresponds exactly to 30·0 ins. the distance between the cross lines on the two glasses shall agree with the scale value supplied by the Meteorological Office—are then moved until they stand tangential to the curve at both the upper

and the lower margins, and the corresponding barometric pressure is then read off, and entered in the line and column of the tabulation form for the corresponding hour and day. This is done for every hour of the week's series of curves, and in accordance with the notes on the tabulation.

The absolute highest and lowest points shown on the curve for each day should also be noted and recorded.

A second series of tabulations of a less degree of refinement (to be employed as a check) follows, the readings being made by means of an ivory scale, read to the nearest hundredth of an inch only, and the readings entered in a second blank form known as a Subsidiary Sheet. If possible the two sets of measurements should be taken by different persons.

The entries in the first form, in hundredths only, are then copied into the subsidiary sheet beside the other set. The differences are next taken, and when they exceed ·01 inch from the normal, a re-examination of the corresponding point on the curve is made, the faulty reading crossed through (not erased or altered), and the corrected value entered above it.

Should any portion of the curves be too faint for measurement with the ordinary tabulating instrument, but not for the ivory scale, it ought to be so measured, such measurements to be indicated in the tabulations by the addition of the word "approximate." On no account should the curves be pencilled or inked in.

The barogram readings should next be compared with the check observations of the standard barometer.

The readings of the standard having been corrected for index error and for capillarity, and reduced to 32°, should be entered in the "S" column of the tabulation form *prior to the tabulation of the curve.* The values of the barograms, corresponding to the times at which the standards were read, should be measured and entered. The differences between each pair of these observations should then be taken for the period from 11 a.m. of one day to 11 a.m. of the next, and from the mean of all of these which do not vary as much as 0·008 in. from the average of the whole, a mean difference or "residual correction" for the period under discussion is formed. Should less than three standards be available, if it is not the day on which the curves are changed, the *residual* is calculated for the whole curve, but if it be changing day, it is calculated up to midnight of the following day. In extreme cases great range of pressure might modify this rule.

If the resulting mean difference be less than 0·001 in. it is considered that there is no residual correction, and the hourly values should be entered direct into the column headed "Tabulated value corrected." If a residual be formed they should be entered in the "H" column.

The residual correction is applied to all the tabulated values of the barogram, and the corrected values compared with the corresponding standard barometer readings. Where a difference exceeding 0·007. in occurs, an examination of the accuracy of the

curve measurements is made, and if this is found correct, the standard reading is concluded to be erroneous, and is marked on the tabulation sheet by means of brackets as (30·050). If necessary, on account of this rejection, a second residual correction is computed, applied to the original readings, and comparison with standards made anew.

Thermograms.—The thermograms are virtually registers of two separate instruments on one sheet of paper, and are, in the question of tabulation, treated as perfectly independent traces; dry-bulb and wet-bulb thermometer readings.

A thermogram is laid on a flat table, and covered by a glass scale engraved with two sets of parallel lines crossing one another at right angles, arranged to represent degrees of temperature and hours of time; the zero line of the curve is then made to lie along a previously determined line of the degree scale of the glass, whilst the lines crossing are made to correspond with the left-hand margin of the gaps in the curve indicating time.

The observer then having set his scale, and noticed that the indications of stopping and starting the curve are in accordance with the times indicated by the graduations on the glass, proceeds to read the position of the upper margin of the photographic sinuous line as referred to the degree lines every hour, and enter the readings on the corresponding tabulation form. This done for the whole week, the curves are again taken, and re-measured at each hour with an ivory scale, graduated to correspond with the glass scale. The readings of this scale are entered in a subsidiary sheet, as in the case of the barograms, and are compared with the corresponding readings already made by the glass scale, copied from the original tabulation into this sheet. When the difference between the two sets of measurements amounts to 0°·3, the curve is again read off at the point in question, the faulty reading struck through, and the correct one entered above it.

Next, the check observations of the standards, duly corrected for index error, are copied from the journals, and entered into the proper columns in the tabulations.

These are compared with the tabulated values, and if differences exceeding 0°·5 are found, those readings are examined, and, if necessary, the eye observations are struck out by being bracketed.

Finally, the points of maximum and minimum temperature each day are selected on the curves, and their values and times of occurrence noted and recorded.

A similar method of tabulation is pursued with regard to the trace of the wet-bulb thermometer, but with the difference that the observer has to carefully guard against entry of observations for those hours when the curve is marked, indicating that the instrument has been acting improperly.

In the case of the wet-bulb instrument, maxima and minima are not recorded.

Faint curves are to be treated as prescribed for the barograms.

Anemograph.—In this apparatus both velocity and direction of the wind are recorded mechanically on the same sheet of paper.

As the clock moving the recording cylinder is not provided with an automatic time-marker, the only guides as to correct timing of the traces are the positions of the two ends of the curves on the printed sheet, the observer should note that these correspond with the two small pin-holes made by a pricker attached to the instrument, which is depressed momentarily at the times of putting on and taking the sheet off the cylinder. If these do not accord within 10 minutes, with the times indicated by the ends of the traces, a fresh time scale must be ruled to agree with them, and the curves tabulated from the new scale.

The hourly wind velocity is measured with a glass scale, which gives the run of the Robinson cups from 30 minutes before to 30 minutes after each hour.

These values are entered in the tabulation sheet, and a correction for friction theoretically computed by Dr. Robinson applied to all velocities below 11 miles as follows:—

0 m.	- corr.	=	1·5 miles.
1 m. to 3 m.	„	=	1·0 „
4 m. to 10 m.	„	=	0·5 „

No subsidiary measurement is made for each hourly result, it being considered sufficient if the aggregate of the 24 uncorrected hourly velocities agrees within 5 miles with the whole distance run by the wind on the curve.

The wind's direction for every hour is deduced from the position of the centre of the trace, which constantly varies in width owing to the oscillations of the wind. For this purpose another scale is used, engraved to accord with the scale printed upon the paper; should this slightly differ from that determined for each instrument by the operation of orientation performed monthly, due allowance must be made in setting the scale.

The subsidiary measurements in direction are made by inspection of the anemograms and entering on a form the special position of the traces marked thereon for each hour. The results are entered on a special form and compared with the readings obtained by the glass scale.

An examination should be made in all cases where there is a difference of two points between the two readings.

Beckley Rain-Gauge.—This registers the time of fall of rain and the amount deposited in a funnel of 100 square inches area, placed 21 inches above the surface of the ground.

The rain from the funnel runs into a copper bottle floating on mercury, and, by its weight, depresses it. A pencil attached to the bottle is drawn by its descent down the paper wrapped round the drum.

When 20 cubic inches of water, corresponding to a rainfall of two-tenths of an inch, have been collected, a siphon causes the

bottle to discharge, and the float rises to its first position again, carrying the pencil up to the zero of the curve ready to make another trace.

The pencil should be adjusted to press on the paper with such force that it may have sufficient power to make a good trace, but not such as to prevent its rising to the top of the form on the paper, after a discharge assisted by a Stonyhurst lifter.

Measurements of the rain which has fallen during every hour are made from the curves by means of a glass scale. The hourly quantities should be entered in the tabulation form opposite the hour which indicates the end of the period to which the measurement refers, and the sum of the readings for the 24 hours should agree with the quantity gauged at the time of changing of the papers.

General.—The documents and curves should be forwarded to the Meteorological Office every Thursday as directed by the "Diary of Operations."

Regulations as to the Examination of the Tabulations at the Meteorological Office.

Assistant's Instructions.

General.

(1.) Examine each curve in order to see if there is any want of light, bagging, finger-marks, or bad photography.

(2.) See that the clock and shutter have been in good action throughout the curve.

(3.) That the instrumental clock does not differ more than two minutes from the chronometer time as recorded on the curve.

(4.) That the date written on the back of the sheet agrees with that on the face, and that the days of the week and month at the top of the curve are correct.

(5.) That the sheet is properly written upon after the pattern.

(6.) That in the journals the proper day of the month is placed alongside of Sunday, and that the others follow consecutively.

(7.) That the times of starting and stopping the instrument as recorded on the journal have been properly entered on the curve.

(8.) Finally, ascertain, by inspection of the curve, that its times of beginning and ending are the same as those inscribed on the face of the sheet, and that no slipping of the cylinder has taken place.

Barograms.

(9.) See that the journal readings of the standard barometer have been correctly reduced to 32°, and are entered under their proper dates into the barograph tabulation sheets, differences of ·003 in. and upwards being noted as errors of reduction.

(10.) Compute the differences (S—T), (with their proper signs), between the standard reading (S) and the corresponding corrected hourly value of the barograph (T). In all cases of differences exceeding ·007 in. the hourly value should be checked, and if, on repetition, found to be correct, the standard reading should be rejected as probably faulty. The mean monthly differences should be recorded.

(11.) See that the tabulated hourly values have been correctly copied into column "A" of subsidiary sheets, and check the accuracy of the subtractions made in the tables occasionally.

(12.) Investigate all cases where A—B is ·02 in. greater than the normal difference; if an error be revealed in the tabulations, it ought to be corrected and noted at once.

(13.) By means of the ivory scale examine all cases where the differences between two consecutive hourly values amount to or exceed ·05 in. The values are to be corrected for errors of ·01 in. and upwards, a note thereof being made on the "Notes of Errors" Sheet. These corrections ought to be made before the next step in the process is commenced.

(14.) Ascertain the correctness of the computed residual correction, and whenever it is necessary to alter it, the last column of the tabulations should be corrected to correspond.

(15.) Check the accuracy with which the residual corrections have been applied, and correct any errors.

(16.) Make 40 re-measurements in every month's work for each observatory, selecting those parts of the curves most favourable for accurate measurements.

Thermograms.

(17.) See that the journal readings of the standard thermometers are entered under their proper dates into the thermograph tabulation sheets; and that they have been properly corrected for index error.

(18.) See that the tabulated hourly values have been correctly copied into column "A" of subsidiary sheets, and check the accuracy of the subtractions made in the tables occasionally.

(19.) Investigate all cases in which A—B is 0°·5 Fah. or more above the normal difference, and correct any errors.

(20.) Compute the differences (S—T), (with their proper signs), between the standard reading (S) and the corresponding hourly value of the thermogram (T).

(21.) In all cases of differences between "S" and "T" exceeding 0°·5, the hourly value should be checked, and if, on repetition, it be found to be correct, the standard reading should be rejected. The monthly mean differences between the simultaneous standard and thermograph readings should be recorded.

(22.) By means of the ivory scale, examine all cases where the difference between two consecutive hourly values amounts to, or exceeds, 5°·0. The values are to be corrected for errors

of 0°·3, and when they amount to 0°·5 a note thereof is to be sent to the observatory.

(23.) Compare the dry-bulb readings with the corresponding wet ones, marking and examining all those cases in which the latter appear higher than the former.

(24.) Check the accuracy of the times and values of the maximum and minimum temperatures.

(25.) Make 40 re-measurements in every month's tabulations of both the dry and wet bulb traces for each observatory, selecting parts most favourable for accurate measurement.

(26.) Measurements for the purpose of checking the values of the zero lines are to be taken when the mean monthly difference amounts to ±0°·25, the said difference not being caused by errors in measurement, or reading of the standards.

Anemograms.

(27.) Examine each curve in order to see that both pencils work well and freely, that the paper has been accurately attached to the cylinder, and the cylinder has not slipped.

(28.) See that the times of starting and stopping the instrument as recorded by the pricker and traces, do not differ more than five minutes from the chronometer time, inscribed on the sheet.

(29.) Inspect the direction and velocity wind curves in connexion with the tabulated results, in order to ascertain that each curve is tabulated under its proper date.

(30.) Examine all cases in which A—B is *two points* and upwards, and correct when necessary.

(31.) Examine all differences between two consecutive hourly values of velocity amounting to 10 miles.

(32.) Make 40 re-measurements in every month's work for each observatory, both for direction and velocity.

Rain Curves.

(33.) See that the clock has been in proper action; that the pencil has worked well and freely; that the paper has been properly attached to the cylinder; and that the cylinder has not slipped.

(34.) That the curve is properly written upon, and that the times of putting on and taking off, as shown by the trace, do not differ more than five minutes from the recorded times.

(35.) See that the total rainfall entered upon the curves agrees with that shown by the trace, and also with the record of the spare gauge.

(36.) That the trace had been tabulated from hour to hour, and make a general examination of the hourly values.

(37.) See that in tabulating, a proper allowance has been made for retardation of the pencil (through friction), bad attachment, bagging, &c.

GENERAL NOTE.

Whenever any error of time amounting to 10 minutes (and which has not been allowed for in tabulating) is discovered in a curve, re-tabulation will be necessary.

Curves erroneously tabulated should be returned to the observatories for re-tabulation.

Meteorological Office (*Secretary*).

The assistant shall report upon all curves and tabulations that are deficient from any cause, and the Secretary shall make the necessary communications to the Meteorological Council on the one hand, and to the director of the observatory where the failure occurred on the other, with any remarks that may tend in his estimation to obviate in future the causes of failure.

The Secretary shall also cause a tabulated report of the results of the examination of each month's work to be made to the Meteorological Council, and a copy of the "Notes of Errors" to be forwarded to each observatory concerned.

The foregoing regulations apply to the examination of the traces of self-recording instruments, and the tabulation of the numerical values intended for final record and publication. But a general inspection of all the traces should be made immediately on their receipt, so that any defects apparent, on such an examination as can be made without instrumental appliances, may at once be brought to notice.

NOTE B.

Note on Experiments on Pressure of Wind made by Mr. W. H. Dines.

Mr. Dines first took up this subject at the instance of the Wind Force Committee of the Royal Meteorological Society, and his experiments were directed to a re-determination of the factor of the Robinson cup-anemometer, the exact value of which was still involved in some doubt.

The experiments were made with a whirling machine of 29 ft. radius, driven by steam, erected in a level and somewhat sheltered field at Hersham, Walton-on-Thames. The results of the experiments were published in the Quarterly Journal of the Society, Vol. XIV., p. 253, and Vol. XVI., p. 26. Mr. Dines found the factor to be about 2·2, and thus practically confirmed the conclusion of Sir G. G. Stokes, who deduced (Proc. Roy. Soc. 1881, p. 170) the value 2·3, in place of 3 as found by Dr. Robinson.

As Mr. Dines had shown great skill in devising and carrying out these experiments, and had expressed his willingness to continue his researches with his whirling machine, the Council considered it desirable that the opportunity thus presented should be utilised for further experiments in certain branches of aërodynamics.

A grant was accordingly made, and Mr. Dines proceeded to investigate the connexion between the velocity of the wind and the pressure on obstacles of various kinds. A full description of the experiments and of the results was submitted to the Council in May 1889, and has since been published in the Quarterly Journal of the Royal Meteorological Society, Vol. XV., p. 1; it will therefore here suffice to give a summary.

The natural wind is not available for experiments on wind pressure, because it is usually gusty and variable in direction, and because it is not easy to measure its velocity with accuracy. It thus becomes practically necessary to have recourse to a whirling machine. But if such a machine be made on so small a scale that it can be sheltered from the natural wind, then, unless the pressure plate be small, the circularity of the motion introduces a large error, and besides the possibility of the persistence of eddies in the air may be a cause of uncertainty in the results. A whirling machine should be therefore on a large scale and must accordingly be erected in the open air. Under these conditions, the natural wind, which always exists to a greater or less extent, is superposed on the artificial wind, and the total wind, to which the pressure is due, oscillates about a mean value in the course of each revolution of the whirler.

These various difficulties have, however, been obviated by Mr. Dines by means of an ingenious device.

It has long been known that, to a close degree of approximation, wind pressure varies as the square of the velocity of the wind. Now if a weight be swung round in a circle the restraint required to keep it in its course varies as the square of its velocity. It therefore occurred to him to balance the pressure on the experimental plate, when carried round by the arm of the whirler, by the centrifugal force, or tendency to fly outwards, of a weight swung round by the same arm. This plan was found to answer admirably, for when the right amount of centrifugal force for balancing the pressure of the artificial wind was found for any one speed of the whirler, the balance was maintained at all other speeds.

It thus became unnecessary to make any accurate measurements of the rate of revolution of the whirling machine.

Mr. Dines also devised an ingenious arrangement by which the amount of centrifugal force opposing the wind pressure varied automatically, until a true balance was attained. Also since the automatic adjustment did not take place instantaneously, but only by degrees, the disturbance due to natural wind was almost entirely eliminated, and thus experiments were made possible, excepting on days when there was a very high wind.

This is not the place for a full description of the apparatus by which the mechanical principle, explained above, was utilized, but a few words of general explanation are advisable.

The pressure plate was rigidly attached to a short arm, which lay in the same plane as the plate. The other end of the short arm could turn about a pivot which was attached to the long arm of the whirler. When the plate was in position for an experiment, the short arm was in line with the long arm, and the wind pressure tended of course to make the plate turn about the pivot.

The centrifugal force was due to the weight of a horizontal metal bar, at right angles to the long arm of the whirler. This bar could slide through a slot, and when the middle of the bar was at one side of the slot the centrifugal force, due to the revolution of the machine, tended to make the slot turn. The slot was geared to the short arm of the pressure plate by mechanism, which need not be described, so that the centrifugal force reacted against wind pressure. By an automatic action the bar slid through the slot, until, when the weight of the bar was winged out to a certain distance, there was a balance between wind pressure and centrifugal force. Measurement of the distance between the centre of the bar and the slot then gave the amount of force which had been called into play. The tendency of the pressure plate to turn was arrested by two stops, so near together that the plate could only turn through about 1°; it bore on one stop, when the centrifugal force was insufficient for a balance, and on the other when too great. An electrical indicator was devised for detecting on which of the two stops the plate was bearing. An experiment was made by giving a few turns to the machine, and continuing the revolu-

tion until the indicator showed that the plate was bearing on neither stop, or more commonly until it sometimes bore on one stop and sometimes on the other.

For the smaller plates the maximum velocity of which the machine was capable was about 70 miles an hour, but most of the experiments were made at speeds between 20 and 30 miles an hour.

A number of plates and cups of different sizes and shapes were used, and the values given in the following table are the mean of all the experiments made with each particular plate, the number of experiments made with each being given in the last column of the table. Each experiment consisted of about three observations taken in immediate succession. As a rule no plate was tried twice on the same day. With the larger plates a single value seldom differed from the mean by more than 5 per cent., and on the whole the different values were fairly consistent. There were, however, two cases of exception to this statement, and they were the cylindrical surface and the sharp cone when placed in front of the plate. The results of five experiments out of the series of about 150 were rejected.

The particular value of 20·86 miles per hour for the velocity given in the table was chosen for the following reason:—The centre of the pivot about which the pressure plates could turn was 28 ft. 1 in. from the axis of rotation of the whirling machine, and the centre of the plate 28 ft. 7 ins. Taking the numerical value of the acceleration due to gravity as 32·19, these figures give 20·86 miles per hour as the velocity of the centre of the plates at which the centrifugal force acting upon the bar is equal to its weight.

TABLE showing the PRESSURE upon various PLATES at a VELOCITY of 20·86 MILES per HOUR. The Values are reduced to the Standard Temperature and Pressure. The Flat Plates were cut out of Hard Wood $\frac{3}{8}$ in. thick. Allowance has been made for the arm which carried them:—

Plates.	Actual Pressure, in lbs.	Pressure, in lbs. per Square Foot.	No. of Experiments.
A square, each side 4 ins. - - -	·17	1·51	4
A circle, 4·51 ins. diameter, same area -	·17	1·51	9
A rectangle, 16 × 1 ins. - - -	·19	1·70	7
A circle, 6 ins. diameter - - -	·29	1·47	7
A square, each side 8 ins. - - -	·66	1·48	8
A circle, 9·03 ins. diameter, same area -	·67	1·50	12
A rectangle, 16 × 4 ins. - - -	·70	1·58	4
A square, each side 12 ins. - - -	1·57	1·57	7
A circle, 13·54 ins. diameter, same area -	1·55	1·55	14
A rectangle, 24 × 6 ins. - - -	1·56	1·59	6
A square, each side 16 ins. - - -	2·70	1·52	6
A plate, 6 ins. diameter, and $4\frac{1}{4}$ ins. thick -	·28	1·45	5
A cylinder, 6 ins. diameter, and $4\frac{1}{4}$ ins. long -	·18	0·92	4
A sphere, 6 ins. diameter - - -	·13	0·67	8
A plate, 6 ins. diameter, with a blunt corner angle 90°, at the back - - -	·29	1·49	4

Plates.	Actual Pressure, in lbs.	Pressure, in lbs. per Square Foot.	No. of Experiments.
The same, with cone in front - - -	·19	0·98	4
A plate, 6 ins. diameter, with a sharp cone, angle 30°, at the back - - -	·30	1·54	4
The same, with cone in front - - -	·12	0·60	4
A 5-inch Robinson cup, mounted on 8½ ins. of ½-in. rod - - - - -	·28	1·68	8
The same, with its back to the wind - -	·12	0·73	4
A 9-in. cup, mounted on 6½ ins. of ⅝-in. rod - - - - - -	·82	1·75	3
The same, with its back to the wind - -	·28	0·60	3
A 2½-in. cup, mounted on 9¾ ins. of ¼ in. rod - - - - - -	·13	2·60	3
The same, with its back to the wind - -	·05	1·04	3
One foot of ⅝ in. circular rod - - -	·09	1·71	9

The results of the table may be roughly summarized as follows: The pressure upon a plane area of fairly compact form is about 1½ lb. per square foot at a velocity of 21 miles per hour, or in other words, a pressure of 1 lb. per square foot is caused by a wind of a little more than 17 miles per hour.

Experiments were also made with two kinds of plates made of perforated zinc. The pressure on the first kind, which contained about 77 holes of ·08 in. diameter per square inch, was 9 per cent. less than on a solid plate, but gave the high value of 2·43 lbs. pressure per square foot of actual surface. The values for the second kind, having 11 to 12 holes of ·22 in. diameter per square inch, were 20 per cent. less than on a solid plate, and gave about 2 lbs. per square foot of actual surface.

It was necessary to stiffen these plates by turning up the edges, and it was found that this edge when presented to the wind increased the pressure by about 6 per cent.

A cone and a projecting rim, when put at the back of the foot circular plate, caused no appreciable alteration in the pressure, but when the rim projected in front the results were:—

An increase of 6 per cent. with a projection of ⅛ in.
„ 10 „ „ „ ⅜ „
„ 14 „ „ „ ⅝ „

The effect of cutting holes in the foot square plates was also tried —eight circular holes, each of one square inch area, being made, four as near the centre as possible, and one close to each corner. No difference in the pressure could be detected, whether any or all of the holes were covered or open. The eight holes together take away more than 5 per cent. of the plate, yet a difference of 1 per cent. in the pressure, had it existed, would certainly have been apparent.

The pressure upon the same area is increased by increasing the perimeter. The pressure upon any surface is but slightly altered by a cone or rim projecting at the back, a cone seeming to cause a slight increase, but a rim having apparently no effect. This result

is of importance, since a pressure plate for permanent use should be of some material which will not warp, and if thin metal be used a rim is necessary to obtain the requisite stiffness. As might be expected, a cone in front greatly reduces the pressure.

Mr. Dines next determined the moment of pressure upon a 5-in. Robinson cup when placed at different angles to the wind from 0° to 180°. The cup was mounted upon an arm 1 foot in length.

The moment varied as the square of the velocity, so that the same mechanical device as before was again applicable.

The following table gives the moment in feet and pounds when the velocity of the wind is 20·94 miles an hour. The angles are measured, so that when the wind blew straight into the concavity of the cup its incidence is 0°; when it blew across the mouth of the cup it is 90°, and when it blew at the back it is 180°

At angle of	0°	moment	=	·284
,,	12°	,,	=	·292
,,	24°	,,	=	·303
,,	36°	,,	=	·303
,,	48°	,,	=	·317
,,	60°	,,	=	·246
,,	72°	,,	=	·127
,,	84°	,,	=	·048
,,	96°	,,	=	− ·014
,,	108°	,,	=	− ·050
,,	120°	,,	=	− ·046
,,	132°	,,	=	− ·073
,,	144°	,,	=	− ·110
,,	156°	,,	=	− ·116
,,	168°	,,	=	− ·124
,,	180°	,,	=	− ·127

In Sir G. Stokes's bridled anemometer the rotation of the cups is not free as in the ordinary instrument, but is restrained by the action of a spring or weight. The amount of torsion of the spindle which bears the cups is the datum from which the velocity of the wind is deduced. One of these anemometers is under trial at Holyhead.

The instrument ought of course to give constant results from whatever quarter the wind blows, and thus the torsional force required to hold the spindle bearing the cups ought to be independent of the orientation of the wind with respect to the cups. Sir G. Stokes has used Mr. Dines's results with respect to a single cup to determine the inequality, according to orientation, of the action of the wind on a bridled anemometer, consisting of any number of cups from one to six. In Mr. Dines's table, given above, the semi-circumference is divided into 15 equal parts, and accordingly there are materials for computing the action of the wind on an anemometer of one or several cups in 30 different azimuths. It is obvious that if there are several cups, the same

torsional couple is repeated several times over; if, for example, there are two cups, there will be 15 different azimuths, if three, 10 different ones, and so on.

The mean of Mr. Dines's numbers, when repeated so as to go round the whole circumference, is 80, hence the mean couple due to a single cup may be taken as 80. Sir G. Stokes then computed the couple due to pressure on a single cup for the 30 azimuths, with such repetitions as correspond to an anemometer with 1, 2, 3, 4, 5, 6 cups, and subtracted from each the mean couple 80.

For example, when there are six cups, the excess above or defect below 80 is + 12, + 1, − 5, − 12, + 1, repeated six times in all. The sum of these five numbers, regardless of sign, is 31, and their fifth part is 6·2. Hence the average inequality with six cups is represented by 6·2, the mean couple being represented by 8·0. In this way he found that, still taking the mean couple as 80, the average inequality is as follows: —

With 1 cup,	161·5.
With 2 cups,	28·2.
With 3 cups,	19·3.
With 4 cups,	17·2.
With 5 cups,	4·8.
With 6 cups,	6·2.

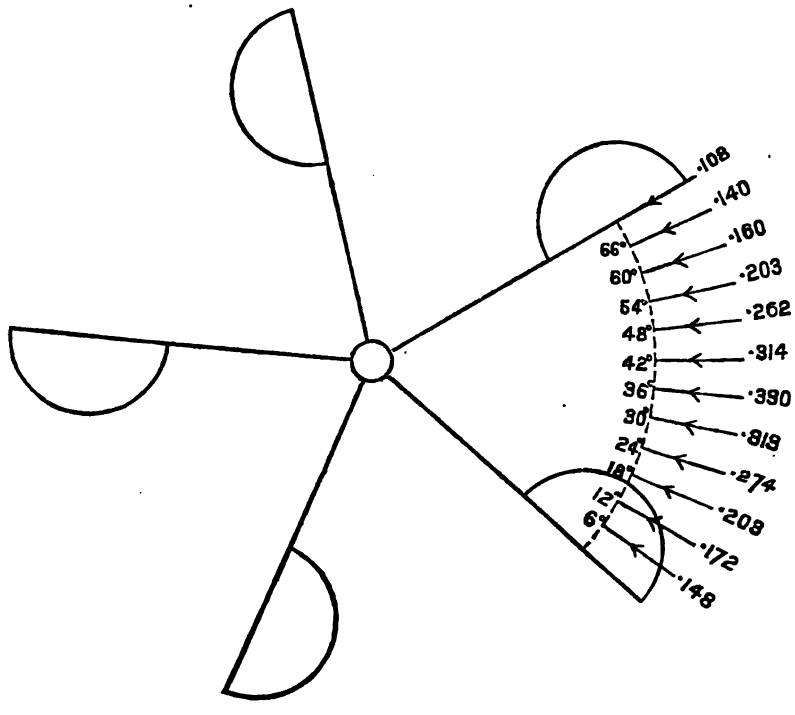
It is obvious that the smallness of these numbers is a measure of the goodness of the instrument as a wind measurer. In designing the instrument, Sir G. Stokes had had an impression that an odd number of cups would be better than an even number, and this appears to be borne out by the numbers. There is naturally a diminution in the inequality with the increase in the number of cups, but this appears to be blended with a superiority of odd to even. Thus 3 cups come out nearly as good as 4, and 5 rather better than 6.

If 6 cups be taken as a superior limit to the number desirable, 5 appears to be the best number to choose.

Sir G. Stokes had been induced to undertake this investigation (which was communicated to the Council in the form of a letter) by some further experiments by Mr. Dines, to which we now return.

Mr. Dines, then, tested an anemometer of five cups, exactly like that at Holyhead, by the same method as that by which he had previously treated the pressure plates. He found that the magnitude of the moment due to the wind was greatly influenced by orientation. The values for positions at intervals of 6° are shown in the annexed diagram, each value being the mean of several observations. The results of the experiments were fairly consistent with one another, the observation for each angle seldom differing by more than three or four per cent. from the mean value.

FIG. 1.



BRIDLED ANEMOMETER.

The figures show the moment, expressed in lbs. and feet, exerted by a wind of 21 *miles per hour. The direction of the wind relatively to the cups is shown by the line against which the figures are placed. In all cases the moment varies as the square of the velocity.*

It was obvious from the consideration of these numbers that the great inequality in the torsional force is not due to the causes considered by Sir G. Stokes, but arises from the interference of each cup with the one partially behind it.

In consequence of these investigations, it was therefore decided to reconstruct the anemometer, retaining five cups in accordance with Sir G. Stokes's views, but re-arranging them spirally on their spindle, so that the interference detected by Mr. Dines should be obviated.

Mr. Dines was then requested to undertake a new series of experiments on the bridled anemometer in its modified form. On the completion of his experiments he submitted the following report to the Meteorological Council :—

"DETERMINATION of the MOMENT of the WIND FORCE upon the " new arrangement of CUPS of the BRIDLED ANEMOMETER.

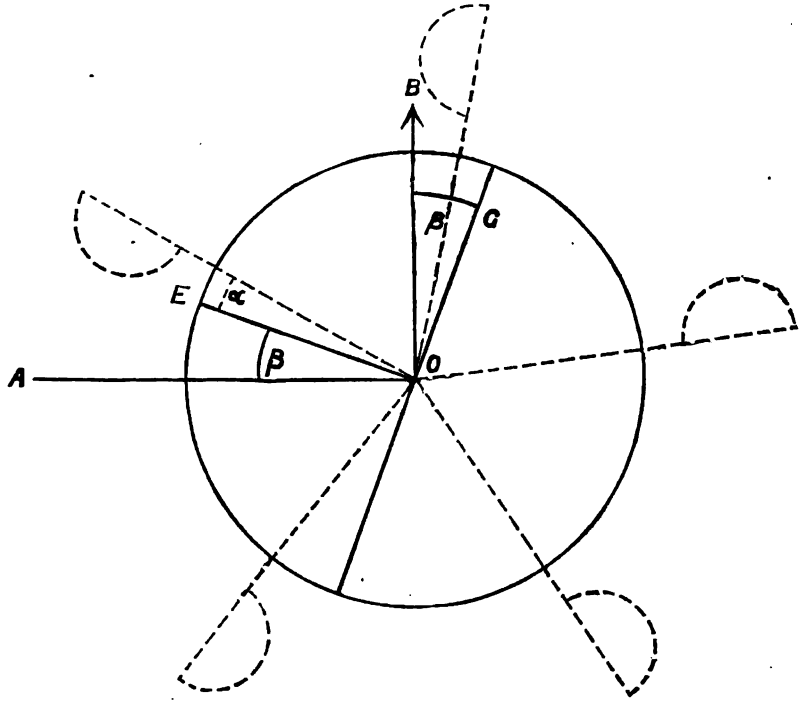
"The instrument consists of five cups, each 5 ins. diameter " mounted with their centres 7½ ins. from the axis. The cups are

" not in one plane, but are arranged so that there is 1 in. clear " vertical space between the rims of two consecutive cups, and a " difference of 144° azimuth.

" Since the length of the axis rendered it impossible to use the " method which was adopted with the old instrument, the follow- " ing plan was adopted.

" A thin metal disc graduated in degrees round part of its " circumference was made to fit loosely on the bottom of the shaft " of the anemometer, and was provided with a screw by which it " could be clamped in any position. A brass weight was attached " to the disc at 3 ins. from the centre, and at the same distance on " the opposite side of the centre an exactly equal piece of wood " was placed to neutralize the wind pressure upon the brass. The " whole was fitted in a light iron frame so that it could turn freely " about its axis. The frame could be attached to the long arm " of the whirler, so that the axis of the instrument was vertical, " and consequently the disc horizontal.

FIG. 2.



" Suppose *O* to be the centre of the disc, *O A* the direction of " the line joining *O* with the centre of the whirling machine. *O B* " the direction of motion, *G* the position of the weight, and *E* the " zero mark of the graduations, *O G* being at right angles to *O E*.

" Let the angle between $O E$ and the vertical plane through one " of the cup arms be α, and the angle $A O E$, or $B O G$ be β.

" It is clear that if a sufficient weight be placed at G, the " centrifugal force upon the weight will prevent the complete " rotation of the cups, and that there will be some value of β lying " between 0° and 90° which will be in a position of equilibrium.

" The experiments were made thus:—The disc was clamped so " that α had a certain value, the whirling machine was then rotated, " and soon after a steady velocity had been obtained, a brake was " applied to the disc by a string running from the centre of the " whirling machine, in order that no change of position should be " possible until the reading had been obtained. The machine was " then stopped and the value of B read off to the nearest degree. " The value of $\alpha + \beta$ gave the direction of the wind relatively to " the cups, the moment of the force exerted by the wind at the " instant of applying the brake being proportional to $\cos \beta$.

" In order that the scale might be an open one, a weight was " chosen which gave the position of equilibrium with a small value " of β. If W be this weight the moment due to the centrifugal " force is $\frac{W v^2}{g (r + O G \sin \beta)} O G \cos \beta$.

" As has been explained in my account of the experiments with " pressure plates, the actual velocity v need not be measured, and " is immaterial to the result, but in these experiments a high " velocity of about 60 miles per hour has been employed to elimi- " nate as far as possible the troublesome error due to the natural " wind. Assuming that the position of equilibrium is taken up " immediately, it will be seen that the natural wind may either " raise or lower the moment as determined by this method. If the " brake be applied when the instrument is moving with the wind " the apparent moment is lowered, and conversely. On the whole, " however, the tendency is to increase the moment, so that the " error cannot be eliminated by taking the mean of a large " number of observations.

" Care has been taken that the brake should not be applied in " any one part of the circle more than in another, and no experi- " ment has been entered which was made at any time when there " was the smallest perceptible wind. Still a wind of two miles per " hour is barely perceptible in the open air, and such a wind " might alter the moment in the ratio of $58^2 : 60^2$, that is, cause " an error of from 6 to 7 per cent.

" About 80 experiments have been made and worked up thus:— " A row of figures from 1 to 72 being prepared, the value of $\cos \beta$ " was taken from a table and placed opposite to the figure indica- " ting the value of $\alpha + \beta$ for the same experiment. In the first " experiments the value of α was chosen at random, but in " subsequent experiments it was chosen so as to fill in the blanks " left in the list as far as possible.

" When the whole set of experiments had been thus tabulated it " was found that the mean value of $\cos \beta$ was ·965, the lowest value

" ·900, and that there was no very marked variation in the value of " cos β in different parts of the list. The figures were pretty " evenly distributed, there being no case of four consecutive " numbers, without at least one value opposite to them.

"The difference in weight of the brass and the facsimile piece of " wood was found to be 6,259 grains, and the distance of the axis " of the instrument from the axis of the whirling machine 28 feet " 11 inches.

"Taking these values for a first approximation we obtain " ·000510 V^2 for the value of the moment expressed in feet and " lbs., V being in miles per hour.

"The experiments were made at temperatures ranging from " 60°—70° F. and mostly between 60° and 65°; and at a pressure " ranging from 29·80 ins. to 30·00 ins.

" One more correction is necessary; the cup which was concave " to the wind was inside, and hence the above value is rather too " low. Reference to the table of wind moments for a single cup " in various positions, given in a preceding report, will show that " this correction should be about 1·5 per cent., and hence that " ·0005523 V^2 is the value of the moment due to the wind " pressure upon the instrument. This result is in close agree- " ment with that deduced from the experiments upon a single " cup, and may, I think, be taken as very nearly correct. I " think also that no greater departure than 3 per cent. from " the mean value occurs in any relative position of the wind " direction and the cups.

" W. H. DINES."

Upon the conclusion of these experiments the instrument at Holyhead was dismounted, and it is being reconstructed with the cups arranged spirally on the spindle, as explained above.

The foregoing experiments of Mr. Dines have given such valuable results that the Council have requested him to continue his investigations, with the aid of a further grant of money. This series of experiments was to be on the resistance of plates of various forms at oblique incidences of the wind, and a memorandum of suggestions, as to the line which the experiments should take, was drawn up by Professor Darwin. The account of this work will fall into the annual report of an ensuing year, and it must here suffice to say that the results have proved of the highest interest, and are to be communicated to the Royal Society.*

* A paper containing an account of the experiments was read before the Royal Society on June 19th, 1890.

NOTE C.

Experiments with Violle's Actinometer Apparatus.

The *Boules conjuguées* of M. Violle are an instrument for readily measuring the solar radiation. Like the sun thermometer, as ordinarily used, it gives a relative measurement of the total radiation effect of the sun and sky, in excess of the air temperature, but according to the theory of its action as described by the inventor, with proper precautions, it may be made to furnish that of the solar intensity alone in terms of absolute units. Its principle is the same as that of the blackened and uncoated sun thermometers, used in conjunction, the theory of which has been given by Ferrell, and it is used in the same manner, viz., by exposure to the sun until its temperature has become constant.

It consists of two thin hollow copper spheres, the one coated with lamp black, the other gilt, which surround the bulbs of two thermometers precisely similar in all respects. The interior of the copper spheres and the bulbs of the enclosed thermometers are coated with lamp black. They are exposed to the sun, side by side, and when the temperatures have become constant readings of the two thermometers are taken, and at the same time the temperature of the air is observed with a sling thermometer. From these three observations the radiation coefficient is computed by a simple formula or taken from a table.

Theoretically the excess temperatures of the blackened and gilt spheres above that of the air should bear a constant proportion to each other, both varying directly with the quantity of heat received in the unit of time by radiation. The object of the tests now being applied at Kew is to ascertain whether this condition is fulfilled in practice, or whether such small variations in the coating of the spheres and the enclosed bulbs, in the circumstances of exposure, &c., as are unavoidable with different instruments, or with the same instruments at different times, seriously impair the constancy and comparability of the registers. For this purpose two pairs of spheres are now under trial, and the readings of the four thermometers will be compared with each other to see if their relative values are sensibly constant; whether, in short, the instrument is one that can be placed in the hands of meteorological observers, who have had no special training in a physical laboratory, in the expectation that the results will be more satisfactory than those yielded by the ordinary sun thermometer.

NOTE D.

On the WORK done with the HARMONIC ANALYSER at the METEOROLOGICAL OFFICE.

THE Harmonic Analyser was designed by Sir William Thomson in 1878. Full details of the principle of the instrument will be found in the Proceedings of the Royal Society, Vols. XXIV., p. 262, and XXVII., p. 371; while a description of the machine as constructed for this Office, and also of the method of its employment, is given in Vol. XL., p. 382. Reports as to the method of employing the machine will be found in the Reports of the Meteorological Council for the years 1880, 1881, 1883, and 1885.

The hope was at first entertained that the machine would admit of the labour involved in making the hourly measurements of the photographic traces being dispensed with, and that the harmonic constants could by means of the machine be derived directly from the curves.

For some time after the machine had been delivered at the Office only experimental work was carried on with it, for the double purpose of determining the constants of the machine and the reliability of its results, and also of familiarizing the operator with its use.

The analysis of the thermograms for the year 1876 was first taken in hand, because for that year the mean hourly values of temperature had been calculated, from the published hourly values for the seven observatories, and the data were thus supplied from which the results obtained by the use of the machine could be compared with results obtained by computation. As this was the first operation in which the machine was brought into continuous use, the results were submitted to an examination by Professor Stokes, who instituted "a more searching comparison between the "results obtained by the machine and those got by calculation "than had previously been possible from the available data," with the object of ascertaining whether there was in them any indication of systematic errors, and to what extent they might be relied upon as correct.

The conclusions arrived at, together with the figures upon which they are based, were published by the Meteorological Office in 1884 as an Appendix to the Quarterly Weather Report for 1876, p. [39], the concluding paragraphs of which are as follows:—

"Disregarding now the systematic character of some of the errors, and treating them as purely casual, we get as the average difference between the constants as got by the machine and by calculation from the 24-hourly means 0·065. It may be noticed, however, that the numbers are unusually large (and at the same time very decidedly systematic) in the case of the second cylinder of the first order, for which the average is as much as 0·125, the eighth of a degree. If b_1 be omitted, the average for the remaining cylinders of the machine is reduced to 0·047.

"We see, therefore, that with the exception perhaps of b_1, the constants got by the machine for the mean of the days constituting a month are as accurate as those got by calculation which requires considerably more time, inasmuch as the hourly lines have to be drawn on the photograms, then measured, then meaned, and the constants deduced from the means by a numerical process by no means very short."

While these preliminary trials had been going on it had not been thought expedient to discontinue making the hourly measurements of the curves and publishing the hourly values thus obtained, but hourly means were not computed. At the same time General Strachey, F.R.S., had been occupied in computing the harmonic constants of the entire series of barometric and thermometric observations made at Greenwich for the 20 years between 1849 and 1868, and as he was desirous of obtaining as complete data as possible for comparison with those he had obtained, it was considered that the satisfactory results of the treatment of the photograms of 1876 justified the extension of the use of the machine to the whole series of records of the seven observatories, which in the absence of computed hourly mean values could not otherwise be dealt with.

The analysis of the temperature records for the 12 years 1871–1882 was therefore carried out, and the results were published in 1886 as an appendix to the volume of "Hourly Readings" for the year 1883, in which the harmonic constants of the diurnal march of temperature at each of the seven observatories are given for every month and year of the period.

Subsequently the barograms for the same period were similarly dealt with, but the results have not yet been published.

With a view of obtaining as complete a knowledge as possible of the reliance that can be put on the results derived from the machine, a further set of trials has been carried out by Mr. R. Curtis, which are described in the supplementary note which is annexed.

After careful consideration of the results of this further examination of the operation of the machine, the Council have been induced to modify their former opinions regarding its practical application. For since they have decided to publish the hourly numerical mean values, which are necessarily derived from the measurements of the curves, there is no room to doubt that the harmonic constants can be obtained from these mean values arithmetically with less labour and with greater accuracy than by the use of the machine, while the results can be far more readily and completely checked.

The Council being of opinion that the harmonic analysis of the chief meteorological phenomena should invariably follow the computation of the requisite mean values, they have, for the reasons above stated, resolved that the analysis shall be made by arithmetical computation, while the use of the machine will be reserved for special occasions when its use may be found desirable.

MEMORANDUM by Mr. R. CURTIS.

THE object of these experiments has been to find out how far the actual readings obtained from the harmonic analyser may be relied upon as correct, and to ascertain something of the nature and magnitude of the errors which may be expected to exist in them.

It should be said that at present the only available check upon this portion of the work is to compare the monthly results obtained from cylinder 7 (the mean) with the arithmetical means already obtained from the hourly measurements of the curves. But it is obvious that for the readings of the other six cylinders this test can only be one of the most general character; while as applied to cylinder 7 itself it is by no means so satisfactory as one could wish, since, as these experiments show, the differences between the increments yielded by two tracings of the same curves are often greater than the increments themselves.

The insufficiency of this test has been further shown by these experiments, in having disclosed two important errors in the original operation which the comparison failed to reveal, and which nothing short of re-analysing the curves could be expected to show.

In both instances a temperature curve for one day was passed twice through the machine, and necessarily on both occasions another curve must have been omitted altogether, otherwise the error would have been detected; yet although the error extended in each instance over several days, both escaped detection on comparison with the monthly mean. It is perfectly easy to account for the occurrence of such accidents as these, and bearing in mind the many ways in which they could happen, I think it by no means unlikely that in so large a piece of work as the analysis of the thermograms and barograms, which extends over 12 years records, and involves dealing with an aggregate of upwards of 61,300 days' traces, many of them may exist. It is therefore important to remember that for their detection the comparison of the mechanically and arithmetically derived means is not likely to be of much use.

In the present experiments the thermograms and barograms for Valencia for the year 1877 were again passed through the machine, using the same data for the setting of the machine as on the first occasion, but, in order to guard against the possibility of bias in any direction, not allowing the operator to see any of the original results during the progress of the work. The year 1877 was selected for no other reason than that it was about the middle of the series of years dealt with, and therefore likely to represent a fair average of the work; but it was a

good year to select for the purpose in view for this further reason that it embraced very few cases of defective photography, and those only for short intervals, and therefore the chance that differences would arise from this cause, in the way alluded to later on, was very small.

Thermograms.

Cylinder 7 (mean).—The readings on this cylinder all through the operation were higher than on the first occasion, and the final reading at the close of the year was + 53·685 instead of +48·358, a difference of 5·327 turns of the cylinder. As, however, we deal with *daily* means, these numbers have to be divided by the number of days in the period, and doing this we get a difference of 0°·11 in the mean daily temperature for the year.

In the mean daily temperature obtained from the *monthly* increments we find larger differences between the two operations:—

January = + 0°·3; February, + 0°·25; March, + 0°·21; April, + 0°·04; May, + 0°·02; June, + 0°·02; July, + 0°·02; August, − 0°·005; September, + 0°·07; October, + 0°·06; November, + 0°·12; December, + 0°·18.

It is worth noting here that the differences are large only in the winter months, from April to October they are insignificant, and in August the very trifling difference shown has a minus instead of a plus sign.

The largest differences are of course found between the readings for single days, and the largest of these amounts to 0°·65; the extreme *range* of the differences (from largest + to largest −) amounted to 1°·2.

I think these differences are entirely due to the way in which the curves were traced by the operator on the two occasions, and not to any error in the "setting" of the instrument. Every care was taken to set the ball correctly upon the disc, and if any error had been made here it would have been the same thing as taking an incorrect value for the centre of the disc, which would have given an error constant in sign and amount throughout, which is not what we get.

But to test this point the month of January was passed through the machine a third time, after I had myself examined it to see that the adjustments were good, the zero pointers being then shifted so that an entirely fresh start should be made, as before. In this case the increments were nearly all smaller than in the second operation, though still larger than in the first, the mean daily temperature being 0°·13 lower than the one and

0°·17 higher than the other, a result which I think bears out my suggestion; as I explain further on, the exigencies of the machine make it a difficult task to pass a curve such as a thermogram twice through with exactly the same result.

Cylinders 1 and 2.—In the case of these cylinders the differences were small, the increments being themselves usually very slight; but relatively to the latter they were sometimes considerable, and occasionally as large as the increment itself. The final reading at the close of the operation gave a difference in the daily mean for the year of only − 0°·03 in a_1 and of + 0°·04 in b_1 but as will be seen from the table appended, the daily differences for the months were larger. It is to be noted, however, that the differences varied a good deal in sign, and so tended to cancel each other in the mean.

Some very large differences were found upon examination to be due to the accidental omission of a curve, as already explained.

Cylinders 3, 4, 5, and 6.—Here again the differences are only considerable when they are compared with the size of the increments themselves. The mean daily differences for the year are, in the case of each cylinder, insignificant, but for the month they are sometimes larger. These cylinders were only read at the end of each five days, and it is of course with those readings that the largest differences occur, as, for example, at the close of the first five-day period, when we have—

——	Cylinder 3.	Cylinder 4.	Cylinder 5.	Cylinder 6.
Reading - -	·020	·065	·016	·100
Difference - -	·015	·022	·018	·010

the difference on cylinder 4 being equal to 0°·13.

Barograms.

Cylinder 7 (mean).—The difference between the mean daily pressure for the year, obtained from the final readings of the two operations, is insignificant, but in the daily means for the months the differences are larger, and vary from + ·002 to − ·004 inch. The largest difference between the two readings for any one day is equal to ·026 inch, and these daily differences range from + ·026 to − ·017 inch. Taking the daily readings of this cylinder as a whole, the differences appear large relatively to the size of the increments, but owing to their constant change of sign they tend to cancel each other as the period over which the mean is taken is lengthened.

Cylinders 1 to 6.—The results here seem to be very similar to those obtained from the re-analysis of the thermograms, and although the differences are all small, yet they frequently bear a considerable proportion to the increments themselves. It is noticeable that there is no indication of any bias on the part of the operator in any one direction, and from this I conclude that the differences indicate fairly the limits within which a set of barograms may be expected upon re-analysis to yield the same results.

In passing a curve through the machine two things have to be attended to: first, the zero line of the curve has to be made to conform to a *fixed* pointer at one end of the cylinder over which the curve is fed; and secondly, a *movable* pointer has to be made to travel over the edge of the trace itself.

In the case of a thermogram the zero is supposed to be a straight line, but practically it is seldom so, owing to an unequal shrinking which occurs in the sheets in drying after completing the photographic process, and which causes a certain amount of curvature in the line known as "bagging." The amount of bagging varies a good deal, sometimes it is very trifling and sometimes considerable.

The zero line of a barogram is the "temperature edge" of the curve, and is not supposed to be straight but to vary with the temperature, owing to the action of the temperature compensation-arrangement of the barograph. In addition to this the curves "bag," as do the thermograms.

The difficulty in dealing with the curves in the harmonic analyser lies in having to keep the two pointers correctly placed at one and the same time. If the zero pointer gets off the line it can only be set right by shifting the sheet, and this has to be done so that it shall then be fed into the machine in such a way that the line shall keep under the pointer for as much of the curve as possible. In doing this there is no room for previous trial as to the effect of the shift before actual working, and although with practice the operator is able to manipulate the sheets in the machine with a good deal of skill, yet it is clear that he cannot always be right, and in any case if the bagging is great the changes have to be frequently made. Besides this there is the risk of his getting considerably off the line before noticing it when his attention is mainly given to following the deviations of the trace with the movable pointer.

It seems to me that here is the weak spot in the machine as we use it. The machine itself leaves little to be desired as regards accuracy of working, as was sufficiently proved long since by the zigzag curves suggested by Prof. Stokes, in which with ordinary care there was no room for error on the part of the operator. The errors now dealt with arise almost solely from the difficulty of following with the necessary accuracy the

edges of the traces, and in the difficulty, almost an impossibility, of ensuring that *both* pointers shall fulfil their functions correctly and continuously lies the chief cause of the differences obtained in passing the same curve twice through the machine.

Another cause of error operating in a similar way is bad photography, since when the curve is very indistinct, it is sometimes impossible to ensure that it shall be followed twice in exactly the same way, and there is always more or less guessing as to what the curve really is.

In addition to this there is the danger of mistake in putting the curves into the machine, the wrong curve may be taken up, or a sheet already in the machine may be used a second time.

And finally, there is the danger of error arising from incorrect reading of the cylinders, or of error in recording the readings upon the sheets.

For errors arising from any of these causes the only checks available, without re-working, are the comparison of the results obtained from cylinder 7 with the arithmetical means, and such check as may be applied by an examination of the readings *inter se*.

VALENCIA, 1877.

Barometer.

Month.	Trial.	First Order.		Second Order.		Third Order.		Mean.
		a_1.	b_1.	a_2.	b_2.	a_3.	b_3.	a_0.
January	1st	+0·0047	−0·0377	+0·0055	−0·0101	−0·0006	−0·0007	29·635
	2nd	+0·0048	−0·0369	+0·0064	−0·0101	−0·0008	−0·0008	29·631
February	1st	−0·0047	−0·0068	+0·0052	−0·0036	−0·0018	−0·0006	29·992
	2nd	−0·0044	−0·0078	+0·0057	−0·0032	−0·0020	−0·0003	29·991
March	1st	+0·0086	−0·0109	+0·0074	−0·0033	−0·0010	+0·0011	29·794
	2nd	+0·0078	−0·0096	+0·0062	−0·0039	−0·0022	+0·0015	29·793
April	1st	−0·0008	−0·0042	+0·0056	−0·0017	0·0000	−0·0017	29·608
	2nd	−0·0018	−0·0044	+0·0059	−0·0022	−0·0001	−0·0015	29·610
May	1st	−0·0010	+0·0031	+0·0055	+0·0038	+0·0013	+0·0021	29·810
	2nd	−0·0008	+0·0026	+0·0063	+0·0031	+0·0003	+0·0019	29·808
June	1st	−0·0075	−0·0153	+0·0073	−0·0096	+0·0020	−0·0069	29·913
	2nd	−0·0078	−0·0153	+0·0079	−0·0099	+0·0012	−0·0055	29·911
July	1st	+0·0016	−0·0068	+0·0048	−0·0020	+0·0018	−0·0011	29·913
	2nd	+0·0016	−0·0068	+0·0059	−0·0025	+0·0013	−0·0012	29·912
August	1st	−0·0091	−0·0091	+0·0057	−0·0027	+0·0018	−0·0016	29·784
	2nd	−0·0094	−0·0091	+0·0055	−0·0029	+0·0009	−0·0009	29·786
September	1st	+0·0008	+0·0070	+0·0026	−0·0034	+0·0019	+0·0011	30·048
	2nd	+0·0008	+0·0058	+0·0028	−0·0043	+0·0013	+0·0014	30·049
October	1st	−0·0018	−0·0060	+0·0073	−0·0026	−0·0010	+0·0023	29·895
	2nd	−0·0023	−0·0065	+0·0063	−0·0035	−0·0009	+0·0023	29·897
November	1st	+0·0117	+0·0289	+0·0092	−0·0022	0·0000	+0·0073	29·546
	2nd	+0·0117	+0·0286	+0·0091	−0·0018	−0·0006	+0·0073	29·548
December	1st	−0·0014	−0·0126	+0·0048	−0·0090	−0·0023	+0·0006	30·010
	2nd	−0·0013	−0·0153	+0·0054	−0·0092	−0·0028	+0·0001	30·009

Temperature.

Month.	Trial.	First Order.		Second Order.		Third Order.		Mean.
		a_1.	b_1.	a_2.	b_2.	a_3.	b_3.	a_0.
January	1st	−0°·86	−0°·12	+0°·34	+0°·42	−0°·06	−0°·15	46°·63
	2nd	−0·86	−0·06	+0·38	+0·40	−0·07	−0·13	46·92
	3rd	−0·89	−0·07	+0·38	+0·39	−0·07	−0·14	46·79
February	1st	−0·71	−0·48	+0·29	+0·32	0·00	−0·13	47·50
	2nd	−0·76	−0·47	+0·31	+0·29	+0·01	−0·13	47·74
March	1st	−1·82	−1·26	+0·39	+0·65	+0·01	+0·20	45·41
	2nd	−1·85	−1·30	+0·41	+0·66	+0·01	+0·18	45·62
April	1st	−1·85	−1·72	+0·42	+0·50	+0·06	+0·18	48·59
	2nd	−1·94	−1·77	+0·45	+0·51	+0·11	+0·18	48·64
May	1st	−3·14	−2·51	+0·17	+0·11	+0·24	+0·49	51·12
	2nd	−3·02	−2·46	+0·19	+0·12	+0·27	+0·47	51·15
June	1st	−2·74	−1·69	+0·20	+0·22	+0·10	+0·20	57·24
	2nd	−2·74	−1·81	+0·20	+0·25	+0·10	+0·16	57·67
July	1st	−2·06	−1·23	+0·16	+0·28	+0·15	+0·15	57·58
	2nd	−2·10	−1·31	+0·18	+0·29	+0·17	+0·13	57·61
August	1st	−2·22	−1·27	+0·27	+0·41	+0·11	+0·30	58·47
	2nd	−2·26	−1·43	+0·29	+0·41	+0·06	+0·29	58·47
September	1st	−2·77	−2·22	+0·46	+0·86	+0·13	+0·23	54·95
	2nd	−2·80	−2·32	+0·48	+0·86	+0·13	+0·22	55·02
October	1st	−1·82	−0·56	+0·67	+0·50	−0·06	+0·02	53·76
	2nd	−1·57	−0·89	+0·68	+0·51	−0·06	+0·02	53·82
November	1st	−0·82	−0·38	+0·45	+0·46	−0·12	+0·06	48·52
	2nd	−0·83	−0·40	+0·47	+0·45	−0·13	+0·07	48·64
December	1st	−0·70	−0·44	+0·50	+0·36	−0·10	−0·30	47·07
	2nd	−0·65	−0·42	+0·45	+0·33	−0·10	−0·29	47·25

APPENDIX.

APPENDIX.

APPENDIX I.

Correspondence with H.M. Treasury about Cost of Publications.

(M.O. 480.)

Sir, Treasury Chambers, March 11, 1889.

The Lords Commissioners of Her Majesty's Treasury have before them a letter from the Controller of the Stationery Office, asking for directions as to the limits within which the demands of the Council for printing, &c., are to be complied with by the Stationery Office without special sanction of this Board.

On reference to the figures given in the annual Estimates, and putting aside the cost of printing the Report, which is about covered by the proceeds of its sale, my Lords find that the average printing expenditure during the last ten years is about 2,400*l.* per annum; the average of the first three years being 1,250*l.*, and that of the last seven 2,850*l.* a year.

The great increase in the expenditure appears to have taken place in 1881–2 and in 1882–3, of the cause of which their Lordships have at present no explanation.

Except in 1884–5, when, as my Lords understand, a special work was issued, the expenditure in each of the last six years appears to have remained without material change.

The expense of this service is so considerable that, before giving instructions as to its supply my Lords will be glad to have before them such observations as the Council may desire to offer as to the probable nature and extent of the future demands for printing, &c. My Lords think it right to state that, if it were contemplated that the annual outlay would further increase, they would have to consider as an alternative, whether it would not be possible to fix a maximum limit for work to be done by the Stationery Office within the year; or to allow to the Council a fixed sum in lieu of the free printing at present enjoyed by them.

In connexion with this subject the Controller of the Stationery Office has called the attention of this Board to an alteration which has recently been made in the size of the Weekly Weather Reports and Charts issued by the Council, whereby the cost of the publication will be raised from 273*l.* to 546*l.*

My Lords will be glad to be favoured with the opinion of the Council as to whether this very considerable increase of cost will be justified by a corresponding advantage to the public.

I am, &c.

(Signed) Frank Mowatt.

The Secretary of the
Meteorological Council,
116, Victoria Street, S.W.

(P.C. 1511.)

Sir, Meteorological Office, August 6, 1889.

On receipt of your letter dated the 11th March last, No. 4164, relative to the cost of printing and other work performed by the Stationery Office for the Meteorological Office, the Meteorological

Council took immediate steps for inquiry into the matters specially referred to in that letter.

To enable them to reply to the inquiries of the Lords Commissioners of Her Majesty's Treasury, the Council desired if possible to obtain from the Stationery Office information somewhat in detail as to the cost of the various publications issued from this Office during the years to which special reference is made in your letter. This necessarily occupied some time, and the results have not been such as to admit of any very precise reply being given as to the cause of the increase of expense in printing which is noticed as having taken place in 1881–2 and 1882–3.

The Council have no doubt, however, that the increase of charge after the first three years to which allusion is made was, speaking generally, due to the increased activity at the Office after its re-organisation in 1877. The application of the increased funds placed at the disposal of the Office necessarily involved some expansion of its operations, to meet which those funds were specially assigned; and from the nature of the duties that devolve on the Office, the performance of more work involves an increase in the volume of its publications.

In 1881–2 a change was made in the form of one of the publications of the Office (the Quarterly Weather Report), which involved a large increase to the copper-plate engraving, and was doubtless a cause of increased expenditure; this has now been discontinued. In 1882–3 a special publication was issued relating to the sea off the Cape of Good Hope, which was accompanied by plates, which also must have led to additional charge. In this year, however, the principal increase appears to have been due to the issue during it of publications appertaining to former years, which had fallen into arrear. It is not possible to distinguish properly the yearly cost of the various publications, which in some cases extended over two or more years, and, in the absence of the actual figures, which the Council has not been able to obtain, the best way of judging of this charge will probably be to take as a guide the number of publications issued in the successive years, and their aggregate selling price as fixed by the Stationery Office, which will, no doubt, be some measure of their cost. A statement of this description is annexed, which also indicates the publications which were the most costly.

With reference to the inquiry as to the increased size and cost of the Weekly Weather Report, the Council desire to state that the changes last made were adopted with a view of bringing it more completely up to the standard of information that the present requirements of students of meteorology demand, in relation to the various practical objects and occupations in which the conditions of the weather are important or influential. Among these Agriculture holds a very prominent place, and the reports have been specially framed in communication with persons conversant with the bearing of meteorology on agriculture in view of meeting their wishes.

The attention of the Council having been more particularly directed to this portion of your letter, they have adopted the conclusion that any less full illustration of the conditions of weather over the British Isles and the adjacent countries which influence it, than is now supplied in the Weekly Weather Report, could not be regarded as satisfactory or sufficient, and they deprecate any economy in this direction.

At the same time the Council is fully impressed with the duty imposed upon them of reducing the cost of printing as far as practicable, and they have undertaken a careful revision of their periodical publications, which they have every reason to believe will result in a sub-

stantial reduction of the charge incurred in their behalf at the Stationery Office. The subject will continue to have their attention, and they desire to assure My Lords that every effort will be made on their part to prevent any printing which is not really requisite for the due discharge of the service entrusted to them.

As to the future, the Council have no reason to anticipate any increased demand for printing, but as already mentioned they look to sensible reduction. In modifying the forms of their publications, however, caution is very necessary, and when the revision now proceeding has been completed, they will report its results, and endeavour to supply a standard such as My Lords appear to desire. It may be added that it would assist the Council in controlling this element of expenditure if the Stationery Office from time to time communicated to the Meteorological Office the cost of the work done for it, of which at present it has no means of obtaining any knowledge.

I am, &c.

(Signed) R. STRACHEY,
Chairman of the Meteorological Council.

F. Mowatt, Esq., C.B.,
Assistant Secretary, Treasury.

NUMBER and SELLING PRICE of PUBLICATIONS of the METEOROLOGICAL OFFICE from 1877 to 1887.

Year.	Number.	Aggregate Price.
		£ s. d.
1877	3	3 5 0
1878	2	0 4 6
1879	2	1 1 0
1880	—	—
1881	5	3 8 6
1882	9	19 14 0
1883	5	6 16 6
1884	2	2 13 0
1885	4	8 8 6
1886	2	3 14 6
1887	3	2 8 6

SPECIAL PUBLICATIONS.

		£	s.	d.
1877.	Meteorology of Arctic Regions, 5 Parts - -	1	9	0
1877.	Do. North Atlantic, 31 Charts -	0	15	0
1877.	Quarterly Weather Report, 4 Parts - -	1	1	0
1882.	Do. (3 years) 13 Parts and Appendices -	9	9	0*
1881.	Observations at Stations of Second Order -	1	0	0
1882.	Do. do. -	1	14	6
1884.	Do. do. -	1	15	0
1885.	Do. do. -	1	15	0
1886.	Do. do. -	1	10	0
1887.	Do. do. -	1	12	0

* This charge is spread over several years.

			£	s.	d.
1882.	Hourly Readings of Observations at Special Observatories -	1881, 4 Parts	3	12	6
1882.	Do. do.	1882, 4 Parts	4	8	6
1883.	Do. do.	1883, 4 Parts	4	13	0
1885.	Do. do.	1884, 4 Parts	2	7	6
1886.	Do. do.	1885, 4 Parts	2	4	6
1885.	Weather Charts of Atlantic Ocean, 4 Parts, 33 sheets, each - - - - -		3	8	0
1883.	Sea Temperature Charts - - -		1	1	0
1887.	Barometric Pressure over Oceans - -		0	10	6
1882.	Meteorological Atlas—British Isles - -		0	5	6
1881.	Rainfall Tables—British Isles - - -		0	7	6

APPENDIX II.

LIST of CAPTAINS (and Officers) who have sent in Logs classed as "Excellent" during the year ending March 31, 1890. The figures opposite to each show the total number of such Logs which they have returned to the Office during the period that they have been observing.

Captain's Name.	Number of "Excellent" Logs.	Ship.
Angus, T. S. - - -	1	S.S. "Canton."
Atkinson, G. W. - -	1	S.S. "Kaisar-i-Hind."
Barker, D. Wilson, F.R.Met. Soc.	12	S.S. "Buccaneer."
Baxter, A. S. - - -	4	"City of York."
Belding, R. - - -	2	"Atlantic."
Bennett, E. C. - - -	14	"Thessalus."
Blackburn, Mr. H. S. - -	7	S.S. "Rohilla."
Bolton, S. H. - - -	9	S.S. "Baidar."
Briscoe, R. F. - - -	3	S.S. "Kaisar-i-Hind."
Cameron, J. G., R.N.R. -	5	S.S. "Adriatic."
Cameron, Sub-Lieut. A. C. L., R.N.	1	H.M.S. "Stork."
Campbell, H. - - -	9	S.S. "Ardangorm."
Campbell, J. - - -	7	"Glengarry."
Campbell, R. - - -	3	S.S. "Elton."
Clapp, Staff Comr. E. S., R.N.	10	L.H. Tender "Richmond."
Couper, William - -	2	"Clackmannanshire."
Crighton, A. T. - -	5	SS. "Circe."
Cromarty, D. S. - -	3	"Cassandra."
Crotty, F. H. - - -	4	"Evesham Abbey."
Crowley, C. - - -	3	"Alexander Lawrence."
Crutchley, W. C., R.N.R. -	19	S.S. "Kaikoura."
Dark, S. - - -	3	"Blairgowrie."
Dart, L. C. - - -	10	"Semantha."
Dawson, Comr. L. S., R.N. -	8	H.M.S. "Rambler."
De Horne, M. - - -	1	S.S. "Rohilla."
Docherty, H. - - -	1	"Baron Colonsay."
Drenning, W. B. - -	1	S.S. "Mira."

Captain's Name.	Number of "Excellent" Logs.	Ship.
Dunbar, J. L. - - -	17	S.S. "Arracan."
Dyke, A. H. - - -	3	S.S. "Don."
Dyke, H. W. - - -	8	"Accrington."
England, T. - - -	8	"Jane."
Exham, T. K., F.R.A.S. -	6	S.S. "Esk."
Field, Lieut. and Comr. A. M., R.N.	4	H.M.S. "Dart."
Fraser, W. D. - - -	4	"Thomas S. Stowe."
Fullarton, D. - - -	5	"Timaru."
Garnsworthy, T. - -	1	S.S. "Ardancorrach."
Gillies, W. - - -	1	S.S. "Medway."
Gray, J. - - -	13	S.S. "Hope."
Halley, E. - - -	4	"City of Madras."
Helby, Lieut. H. W. H., R.N. -	1	H.M.S. "Myrmidon."
Hicks, G. M. - - -	2	S.S. "Nile" and S.S. "Neva."
Hird, W. - - -	5	"Marlborough."
Irving, P. J., R.N.R. - -	8	S.S. "Celtic" and S.S. "Germanic."
Jennings, R. C. - -	3	S.S. "Colina."
Jones, S. Griff - -	8	"Hermine."
Kemp, A. H. - - -	3	"Hudson."
Kiddle, Sub-Lieut. E. W., R.N.	5	H.M.S. "Egeria."
King, J. W. - - -	4	"Philomene."
Leportier, T. - - -	9	S.S. "Mira."
Long, Mr. J. C. - -	6	S.S. "Kaisar-i-Hind."
McFee, J. R. - - -	3	"Great Victoria."
McLean, A. - - -	8	S.S. "Concordia."
Marshall, F. - - -	5	"Berkshire."
Mesnard, T. - - -	8	"Sierra Miranda."
Millican, J. W. - -	4	"Myrtle Holme."
Milne, W. F. - - -	7	S.S. "Esquimaux."
Milner, W. H. - - -	8	S.S. "Avon" and S.S. "Neva."
Mitchell, G. - - -	1	S.S. "Trinacria."
Moignard, P. - - -	4	"Astoria."
Molony, E. J. - - -	8	"British Merchant."
Munn, L. A. - - -	2	S.S. "Durban."
Murdoch, P. - - -	10	"Sierra Lucena."
Newton, Mr. T. C., F.R.Met. Soc.	8	S.S. "Minia."
Norman, F. - - -	7	"John O'Gaunt."
North, W. G. - - -	12	S.S. "Tiger and S.S. "Plato."
Oldham, C. F., R.N. - -	9	H.M.S. "Egeria."
Owen, O. - - -	1	S.S. "Cordelia."
Parry, Moses, F.R.Met.Soc. -	15	S.S. "Prydain."
Parsell, H. - - -	12	S.S. "Britannic."
Parson, G. F. - - -	9	"Earnock."
Pasifull, E. J. - - -	1	"Rahane."
Pearson, C. W. - -	29	S.S. "Strathleven."
Pope, J. - - -	2	S.S. "Derwent."
Powles, F. W. - - -	6	S.S. "Essequibo."
Price, J. H. - - -	4	"Viola."
Pullen, Commr. T. F., R.N. -	1	H.M.S. "Stork."

Captain's Name.	Number of "Excellent" Logs.	Ship.
Randall, W. - - -	11	"Laomene."
Read, G. W., F.R.G.S. -	5	S.S. "Auretta."
Richardson, Mr. W. H. -	4	S.S. "Auretta."
Rigaud, H. C. - - -	2	S.S. "Derwent."
Ritchie, A. - - -	2	"Four Winds."
Rosseter, W. L. - -	11	"Columba."
Russell, C. J. - - -	10	"Belfast" and "Holkar."
Saul, J. - - -	1	"Coronilla."
Scott, W. - - -	20	"Winifred."
Shearer, G. - - -	10	"Thetis."
Sibery, H., R.N.R. - -	2	S.S. "Clan Cameron."
Simpson, A. - - -	11	S.S. "Australasian."
Simpson, A. - - -	19	S.S. "Traveller."
Smith, W. C. - - -	11	"John R. Worcester."
Spooner, I. D. - - -	3	S.S. "La Plata."
Spratly, W. - - -	14	S.S. "Mozart."
Stewart, A. - - -	1	"County of Selkirk."
Sturdee, H. K. - -	12	L.H. Tender "Richmond."
Thearle, J. - - -	1	S.S. "Lennox."
Thompson, J. E. - -	2	S.S. "Monarch."
Thompson, Lieut. H., R.N. -	2	H.M.S. "Rambler."
Thomson, A. S. - -	10	S.S. "Silvertown."
Tizard, Staff-Capt. T. H., R.N.	9	H.M.S. "Triton."
Travers, H. C. - - -	7	S.S. "Tartar."
Trevor-Roper, Dr. G. D., R.N.	1	H.M.S. "Stork."
Trott, S., F.R.Met.Soc. -	16	S.S. "Minia."
Trunks, H. - - -	4	"Aldborough."
Vereker, Hon. F. C. P., R.N. -	9	H.M.S. "Myrmidon" and H.M.S. "Rambler."
Wait, A. M. - - -	4	S.S. "Spartan."
Walker, H. - - -	11	S.S. "Servia."
Wheaton, N. J. - -	10	"Eliza."
Wilson, J., R.N.R. - -	4	S.S. "Ethiopia."
Woolward, R. - -	5	S. S "Nile."
Worrall, W. A. - -	1	"Camana."

Names of deceased observers printed in italics.

APPENDIX III.—Ships supplied and Documents returned during the year ending 31st March 1890.

The number of merchant ships supplied with standard instruments and meteorological logs during the above period was 114.

The number of meteorological logs, and documents from Foreign Stations, received during the same period, and registered in the Office, amounted altogether to 353, of which 216 were returned from ships, and the remainder from land stations, outside the British Isles.

List of Documents received from Foreign Land Stations.

Place.	Observer.	No. of Documents.	Nature of Observations.
Abaco (Bahamas) - -	T. R. Thompson, Lightkeeper	1	"Lighthouse" Register, 1889, January to June.
Akassa, Nun River, Niger Delta -	Frank Russell, F.R.G.S. -	5	Two observations daily, 1889, May to November.
Bathurst (Gambia) - -	I. M. Harrison, E. J. Burt, and E. Allen.	1	„ „ „ October 1887 to September 1888.
Beyrout (Lee Observatory) -	R. H. West, M.A. - -	12	„ „ „ February 1889 to February 1890.
Cape Juby (N. W. Africa) -	Hubert Bray - -	3	„ „ „ October 1889 to January 1890.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper -	2	"Lighthouse" Register 1889, January to December.
Cay Lobos (Bahamas) - -	N. H. E. Garner and J. G. Maura, Lightkeepers.	2	„ „ 1889, January to December.
Cay Sal (Bahamas) - -	T. R. Thompson, Lightkeeper	3	„ „ 1888, July to December. 1889, January to December.
Famagusta (Cyprus) - -	G. Eliades - - -	2	Two observations daily, 1888, January to December.
George Town (British Guiana) -	Robert Ward - -	11	„ „ „ 1889, March to December; 1890, January.
Gibraltar - - - -	Staff-Sergeant H. Spuckman, Med. Staff Corps.	12	„ „ „ February 1889 to January 1890.

LIST of DOCUMENTS—*continued.*

Place.	Observer.	No. of Documents.	Nature of Observations.
Grand Bassam - - -	A. Jouve and G. Baillan, West African Tel. Co.	3	Two observations daily, 1888, April to September; 1889, February; 1890, February.
Heligoland - - -	J. J. Friederichs, Lightkeeper	12	„ „ „ March 1889 to February 1890.
Inagua (Bahamas) - -	B. N. Jones and R. A. A. Espie, Lightkeepers.	2	"Lighthouse" Register, 1889, January to December.
Kapalama (Honolulu) - -	Henry Cobb Adams -	11	Two observations daily, 1889, February to December.
Kyrenia (Cyprus) - -	M. Fuleiham - -	2	„ „ „ 1888, January to December.
Larnaca (Cyprus) - -	G. P. Voudiziano - -	2	„ „ „ „ „
Limassol (Cyprus) - -	Luigi Béraud - -	2	„ „ „ „ „
Nicosia (Cyprus) - -	G. Stephen and C. Carletti -	2	„ „ „ „ „
Papho (Cyprus) - - -	E. A. Malliotis - -	2	„ „ „ „ „
Principe Island (West Africa) -	E. Hurdus - - -	2	„ „ „ August 1889 to January 1890.
São Thomé (West Africa) -	E. Hurdus - - -	2	„ „ „ 1888, December; 1889, January and February.
Suva (Fiji) - - -	J. D. W. Vaughan, F.R.Met. Soc.	8	One observation daily, 1887, July; 1888, April to December; 1889, January to December.
Teneriffe (San Antonio) - -	W. L. Boreham (the late), and A. F. Perry.	10	Two observations daily, March 1889 to January 1890.
Tobago - - - -	J. P. Tulloch, M.A., M.B. -	10	„ „ „ 1889, March to December.
Trinidad - - - -	J. H. Hart, Supt. Botanic Gardens.	11	„ „ „ January 1889 to January 1890.
Watling Island (Bahamas) -	S. W. Hall, Lightkeeper -	2	"Lighthouse" Register, 1889, January to December.

List of Documents received from Ships.

Captain's Name.	Ship.	Voyage.	Year.
Anderson, Charles	S.S. Achilles	China, viâ Suez	1886–87
Angus, T. S.	S.S. Canton	Bombay, viâ Suez	1889–90
Armstrong, B. G.	S.S. Elbe	Brazil	1889
Asquith, W.	S.S. Deucalion	China, viâ Suez	1886–88
Atkinson, G. W.	S.S. Kaisar-i-Hind	Calcutta, viâ Suez	1889
Barker, D. W., F.R. Met. Soc.	S.S. Buccaneer	Pernambuco	1889
„ R. J. M.	Earl of Aberdeen	Calcutta	1888–89
Batt, H.	S.S. Hector	China, viâ Suez	1886–88
Baxter, A. S.	City of York	Sydney, Sourabaya (Java)	1888–89
Belding, Rawstin	Barque Atlantic	River Plate	1889
Bennett, E. C.	Thessalus	San Francisco	1888–89
Bennet, J. T.	Alcester	Calcutta	1888–89
Bigley, W. B.	S.S. Diomed	China, viâ Suez	1886–88
Bolton, S. H.	S.S. Baidar	Ports in the Baltic, France, Spain	1889
„ „	„	Spanish Ports	1889–90
Bragg, I. T.	S.S. Antenor	China, viâ Suez	1886
Briscoe, R. F.	S.S. Kaisar-i-Hind	Bombay, China, viâ Suez	1889
Brown, R. J.	S.S. Titan	China, viâ Suez	1886–88
Backler, J. H.	S.S. Dee	West Indies	1888–89
„ „	S.S Solent	„ „	1889
Butler, S. H.	S.S. Priam	China, viâ Suez	1886
Cameron, Hugh	S.S. Ardangorm	Havana, Baltimore	1889
„ „	„	Havana, New Orleans	1889–90
„ John	S.S. Thetis	Odessa, Antwerp	1888
„ J. G., R.N.R.	S.S. Adriatic	New York	1888–89
„ „	„	„	1889
Campbell, James	Glengarry	Calcutta	1889–90
Campbell, Robert	S.S. Elton	Rangoon, viâ Suez, Spezzia	1889
Carse, James	Barque Firth of Solway	Sydney	1888
Chrimes, Henry	S.S. Sarpedon	China, viâ Suez	1886–88
Clapp, Staff-Comr. E. S., R.N.	Schooner Richmond	Bahamas	1889
„ „	„ „	„	1889–90
Conby, H. B.	Garfield	New York, Calcutta	1889–90
„ „	Gilcruix	Calcutta, New York	1888
Couper, William	Clackmannanshire	New Caledonia	1888–89
Crighton, A. T.	S.S. Circe	Baltimore	1888–89
„ „	„	Montreal	1889
Cromarty, D. S.	Barque Cassandra	Autofagasta, New York	1888–89
Crotty, F. H.	Evesham Abbey	Mauritius, Calcutta, New York	1886–89
Crowley, C.	Barque Alexander Lawrence.	Rio Janeiro, New York	1889
Crutchley, W. C., R.N.R.	S.S. Kaikoura	Cape Town, New Zealand, Rio Janeiro	1888–89
„ „ „	„	Wellington, N.Z.	1889
„ „ „	„	Wellington, viâ Cape Town, Rio Janeiro	1889–90
Dark, S.	Blairgowrie	Sydney, San Francisco	1888–89
Dart, L. C.	Barque Semantha	San Francisco	1888–89
Davies, David	Andora	Albany (W.A.), Calcutta, San Francisco, Sydney (N.S.W.)	1888–89
Dawson, L. S., R.N.	H.M.S. Rambler	China Sea, Port Darwin	1889
„ „	„	N.W. Coast of Australia	1889
De Horne, M.	S.S. Rohilla	Bombay, viâ Suez, Hong-Kong	1889
„	„	Calcutta, viâ Suez	1889–90
Dickinson, L. R.	S.S. Atrato	East Coast of South America	1889–90
Docherty, Hugh	Baron Colonsay	Singapore	1888–89
Drenning, W. B.	S.S. Mira	Calcutta, viâ Suez	1889
Dunbar, J. I.	S.S. Arracan	Rangoon, viâ Suez	1889
„ „	„	„ „	1889

	Captain's Name.	Ship.	Voyage.	Year.
	Dunbar, J. I.	S.S. Arracan	Rangoon, viâ Suez	1889–90
17	Dyke, A. Hart	S.S. Don	Monte Video	1889
	„ H. W.	Accrington	New York, Calcutta	1888–89
	„ „	„	New York	1889
	Edwards, T. T.	S.S. Stentor	China, viâ Suez	1886–87
	England, Thomas	Barque Jane	Quebec, Buenos Ayres	1888–89
10	Exham, T. K.	S.S. Esk	West Indies	1888–89
10	„ „	„	„	1889
10	„ „	„	„	1889
18	Field, Lieut. and Comr. A. M., R.N.	H.M.S. Dart	Sydney	1889
17	Ford, H. W.	S.S. Don	Monte Video	1889
	Fraser, W. D.	Barque Thomas S. Stowe	Victoria (B.C.)	1888–89
	Freeman, T. W.	S.S. Antenor	China, viâ Suez	1886
	Fullarton, D.	Timaru	Brisbane	1888–89
	Garnsworthy, Thomas	S.S. Ardancorrach	West Indies, Charleston	1889
	„ „	„ „	Havana, New Orleans	1889–90
19	Gillies, W.	R.M.S. Medway	West Indies	1889
10	„ „	„ „	„	1889
	Gould, H. W.	S.S. Ocean King	New Orleans	1889
	„ „	„ „	Montreal, Norfolk (Va.), Bremen	1889–90
	Gray, John	S.S. Hope	Greenland	1889
	Grier, J. K.	S.S. Antenor	China, viâ Suez	1887–88
20	Griffin, E. J., R.N.R.	S.S. Moor	Cape Town	1889
20	„ „ „	„	„	1889
	Guthrie, W. E.	S.S. Bellerophon	China, viâ Suez	1886
	Halley, E.	City of Madras	Sydney, San Pedro (Cal.), Jacoma (Washington Ter.).	1888–89
	Hannah, W. T.	S.S. Glaucus	China, viâ Suez	1886–88
21	Harris, James	S.S. Circassia	New York	1889
21	„	„	„	1889
22	Hicks, G. M.	R.M.S. Neva	West Coast of South America	1889
	Hird, W.	Marlborough	Lyttleton	1888–89
	Hutchinson, J.	S.S. Orestes	China, viâ Suez	1886–88
	Huxtable, R. G.	Barque Lanarkshire	Adelaide	1889
23	Irving, P. J., R.N.R.	S.S. Celtic	New York	1888–89
24	„ „ „	S.S. Germanic	„	1889
	Jackson, Charles	S.S. Palamed	China, viâ Suez	1886–88
	„ E. T.	S.S. Ajax	„	1887
	„ M. H. F.	S.S. Telamon	„	1886–88
	„ T. S.	S.S. Palinurus	„	1887–88
25	Jennings, R. C.	S.S. Colina	Montreal, Monte Video	1888–89
	„ „	„	Montreal	1889
	Johansen, Augustus	Glenburn	New York, Calcutta	1887–89
	Jones, Henry	S.S. Telemachus	China, viâ Suez	1886–88
	Jones, Richard	Thomas Hilyard	Calcutta	1888–89
26	Jones, S. Griff.	Barque Hermine	Esquimault, Valparaiso	1886–88
	Kemp, A. H.	Barque Hudson	New Zealand	1888–89
	King, J. W.	Philomene	Monte Video	1889–90
	Lapage, W. P.	S.S. Anchises	China, viâ Suez	1886–88
	Leportier, T.	S.S. Mira	Calcutta, viâ Suez	1889
	Lourison, G. M.	Eaton Hall	San Francisco	1889–90
	McFee, J. R.	Great Victoria	San Francisco	1885–86
	„ „	„ „	Newcastle (N.S.W.), San Francisco	1887
	McGonnell, James	Barque Matilda C. Smith	Ensenada, Apalachicola	1889
	Machugh, R. H.	S.S. Ching Wo	China, viâ Suez	1889
	„ „	„ „	„ „	1889–90
	McLean, A.	S.S. Concordia	Montreal, Monte Video	1888–89
	„ „	„ „	Montreal	1889
	Marshall, Frederick	Barque Berkshire	Chittagong	1888–89
	Mesnard, T.	Sierra Miranda	Calcutta	1888–89
	Milburn, W. J.	S.S. Ocean Prince	New York, &c.	1888–89
	„ „	„ „	Porto Rico, Cape Breton	1889
27	Miller, A. T.	H.M.S. Conway	Off Birkenhead	1889
	Millican, J. W.	Barque Myrtle Holme	Adelaide	1889–90
	Milligan, John	S.S. Jason	China, viâ Suez	1888

Captain's Name.	Ship.	Voyage.	Year.
Milligan, Samuel	S.S. Jason	China, viâ Suez	1886
" "	S.S. Stentor	" "	1887–88
Milne, W. F.	S.S. Esquimaux	St. John's (Newfoundland)	1889
Milner, W. H.	R.M.S. Avon	West Indies	1889
" "	"	"	1889
" "	S.S. Neva	Brazil	1889–90
Mitchell, George	S.S. Trinacria	Mediterranean Ports, New York	1888–89
" "	"	New York, Palermo, New Orleans	1889
Moignard, P.	Barque Astoria	Sydney, San Francisco	1888–89
Molony, E. J.	British Merchant	Calcutta	1889
Munn, L. A.	S.S. Durban	Cape Town	1889
Murdoch, Peter	Sierra Lucena	Bombay	1888–89
Nelson, R.	S.S. Menelaus	China, viâ Suez	1886–88
Nish, H.	S.S. Cyclops	" "	1886–83
Norman, Francis	Barque John O'Gaunt	Hobart, Valparaiso	1888–89
North, W. G.	S.S. Plato	Hamburg	1889
" "	S.S. Tiger	"	1889
Oldham, Comr. C. F., R.N.	H.M.S. Egeria	Australian Station	1889
" "	"	"	1889
Owen, Owen	Barque Cordelia	Callao, Havana	1888–90
Parry, Moses	S.S. Prydain	Mediterranean Ports	1888–89
" "	"	Constantinople, Rio Janeiro, Santos, New Orleans	1889–90
Parsell, H.	S.S. Britannic	New York	1888–89
Parson, G. F.	Earnock	Melbourne	1888–89
Pasifull, E. J.	Rahane	San Francisco	1889–90
Pattman, R.	Loch Torridon	New York, Calcutta	1888–89
Paul, John	Barque Glenogle	Callao	1889
Pearson, C. W.	S.S. Strathleven	New York, China, viâ Suez	1888–89
Pike, A.	Walrus sloop Siggen	Spitzbergen	1888–89
Pope, James	S.S. Derwent	West Indies	1889
" "	"	Barbados	1889
Powles, F. W.	S.S. Essequibo	West Indies	1889
" "	"	"	1889
" "	"	"	1889
Price, J. H.	Barque Viola	Vancouver Island	1888–89
Pulford, J.	S.S. Patroclus	China, viâ Suez	1888
Pullen, Comr. T. F., R.N.	H.M.S. Stork	Zanzibar, viâ Suez, Simon's Bay	1888–89
Purdy, T.	S.S. Dardanus	China, viâ Suez	1886–88
Randall, W.	Laomene	New York, Batavia	1888–89
Read, G. W., F.R.G.S.	S.S. Auretta	Colombo, viâ Suez	1889
Reynolds, Robert	S.S. German	Cape Town	1888–89
" "	"	"	1889
Rigaud, H. C.	S.S. Derwent	West Indies	1888–89
" "	S.S. Tamar	Brazil	1889
Riley, J.	S.S. Ajax	China, viâ Suez	1886–88
Ritchie, Alexander	Four Winds	Melbourne, Calcutta	1888–89
Rosseter, W. L.	Columba	Calcutta	1888–89
Russell, C. J.	Belfast	"	1889
" "	Holkar	"	1889
Sargent, A. H.	Glenlora	Nelson, N.Z.	1889
Saul, John	Barque Coronilla	Valparaiso, Hamburg	1888–89
Scale, R. F.	S.S. Laertes	China, viâ Suez	1886–88
Scott, William	Barquentine Winifred	Trinidad	1889
Shearer, George	Barque Thetis	Buenos Ayres	1888–89
Sibery, Harry, R.N.R.	S.S. Clan Cameron	Cape Town, Madras, Port Said	1889
" "	"	Cape Town, Madras, home, viâ Suez	1889–90
Simpson, Alexander	S.S. Australasian	Melbourne, via Cape, home, viâ Suez	1889
" "	"	Melbourne, viâ Cape, Singapore, home, viâ Suez	1889
Simpson, Alexander	S.S. Traveller	Greenland	1889
Smith, J. H.	H.M.S. Worcester	Off Greenhithe	1889
Smith, W. C.	Barque John R. Worcester.	Brisbane, San Francisco, Sydney	1887–89

Voyage.	Year.	
...il - - - -	1889	
- - - -	1889	
... Janeiro, New York, Monte ...ideo - - - -	1888–89	
...nte Video - - -	1889–90	
...ney, San Francisco, Melbourne	1887–89	
...cutta - - -	1889–90	
...w Zealand, Portland (Oregon) -	1888–89	
...pe Town - - -	1888–89	
...na, viâ Suez, New York -	1888–89	
...na, viâ Suez - - -	1886	
...st of British Isles - -	1889	
...na, viâ Suez - - -	1886–88	
...W. Coast of Africa - -	1889	
...sts of British Isles - -	1886–89	
...pe Town - - -	1888–89	
...pe of Good Hope - -	1889	
...th Atlantic - - -	1889	
...lifax - - - -	1889	
,, - - - -	1889–90	
...gapore, Bassein - -	1889	
...dney, Manila - - -	1888	
...ina Sea, Port Darwin - -	1889	
...pe Town - -	1889	
,, - - -	1889	
...w York - - - -	1889	
...na, viâ Suez - - -	1886–87	
...Domingo - - -	1888–89	
...exico - - - -	1889	
...ina, viâ Suez - - -	1886–88	
...w York - - - -	1889	
...est Indies - - -	1889	
,, - - -	1889–90	
...enos Aires, Taltal (Chili) -	1889–90	
...w York - - - -	1888–89	

...gical Registers were kept chiefly by Officers, as

Assisted by J. E. Browne, Chief Officer.
Assisted by Messrs. Belson, Hutchinson, and Peterson.
Kept by the Cadets.
Assisted by J. Brown.
Kept by R. H. Sach, 3rd Officer.
Kept by Lieut. E. B. Kiddle, R.N.
Assisted by M. N. Anderton, Mate.
Kept by J. Christie.
Assisted by G. R. Berwick, 2nd Mate.
Kept by H. W. Beal, 2nd Officer.
Kept by Sub.-Lieut. A. C. L. Cameron and G. D. Trevor-Roper, Surgeon.
Kept by W. H. Richardson, 1st Mate.
Kept by A. H. Rhodes.
Kept by C. E. Down, 2nd Officer.
Assisted by Robert Stirling, 2nd Officer.
Kept by George Adams and C. P. Langmaid.
Kept by George Adams, 4th Officer.
Assisted by T. Lloyd.
Kept by A. F. Halpin, 3rd Officer, assisted by F. Alford and C. J. Hall, 2nd Officers.
Kept by J. Bowyer, 2nd Officer.
Kept by T. C. Newton, 1st Officer.
Kept by Lieut. H. W. H. Helby, R.N.
Kept by R. G. Jackson.
Kept by F. S. Newton, 2nd Officer.
Kept by J. Adams, 2nd Officer.

APPENDIX IV.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Barometers.	Aneroids.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1889, afloat - -	190	455	1,255	262	227	142	78
Issued since - -	98	165	397	70	65	40	26
	288	620	1,652	332	292	182	104
Returned since - -	77	140	324	43	34	15	51
April 1st, 1890, afloat -	211	480	1,328	289	258	167	53

INSTRUMENTS supplied, &c. for use at Naval Stations.

April 1st, 1889, in use -	59	64	192	17	18	3	12
Issued since - -	2	5	52	6	4	8	1
	61	69	244	23	22	11	13
Returned since - -	—	6	36	2	1	8	2
April 1st, 1890, in use -	61	63	208	21	21	3	11

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1890.

Afloat in Royal Navy - -	211	480	1,328	289	258	167	53
In use at stations - -	61	63	208	21	21	3	11
In store at M.O. - -	15	67	390	87	109	38	49
„ Chatham - -	6	6	26	8	6	2	13
„ Sheerness - -	5	5	18	7	7	5	9
„ Portsmouth -	11	33	51	10	13	10	9
„ Devonport -	14	29	37	7	6	2	20
„ Queenstown -	2	5	21	1	1	—	8
„ Gibraltar - -	2	2	14	—	—	—	4
„ Malta - -	4	7	4	—	2	—	17
„ Bombay - -	4	3	12	4	4	1	4
„ Halifax - -	3	10	16	2	3	—	14
„ Bermuda - -	4	16	24	1	6	—	15
„ Jamaica - -	3	3	19	2	2	—	—
„ Cape of Good Hope	2	7	20	6	5	3	8
„ Trincomalee -	4	3	21	4	4	—	—
„ Hong Kong -	6	21	32	15	12	—	17
„ Coquimbo -	2	5	23	1	2	—	19
„ Sydney - -	3	6	13	6	4	—	—
„ Esquimalt - -	8	9	26	3	3	—	—
Total, April 1st, 1890 -	370	780	2,303	474	468	231	270
Lost, &c. since April 1st, 1889	1	12	202	23	8	12	16
Under repair - - -	35	—	—	—	—	—	—

APPENDIX V.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Barometers.	Compasses.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1889, afloat - -	116	—	699	—	—	120	379
Issued since - - -	88	—	532	—	—	79	275
	204	—	1,231	—	—	199	654
Returned since - -	97	—	595	—	—	93	312
April 1st, 1890, afloat - -	107	—	636	—	—	106	342

INSTRUMENTS at Stations, viz., Telegraph Offices, Observatories, Fishing Villages, &c.

April 1st, 1889, in use - -	256	3	275	58	58	36	10
Issued since - - -	15	1	11	1	1	3	1
	271	4	286	59	59	39	11
Returned since - -	15	—	39	4	2	4	—
April 1st, 1890, in use - -	256	4	247	55	57	35	11

DISPOSITION of Board of Trade Instruments on April 1st, 1890.

In merchant ships - -	107	—	636	—	—	106	342
In use at stations - -	256	4	247	55	57	35	11
In store at M.O. - -	89	2	198	19	55	8	98
At Liverpool Agency -	10	7	52	—	—	8	44
„ Aberdeen „ -	2	—	18	—	3	4	8
„ Glasgow „ -	3	—	29	—	—	3	29
„ Dundee „ -	13	—	15	—	—	11	28
„ Hull „ -	8	—	30	—	—	6	26
„ Southampton „ -	8	—	39	—	—	8	30
„ Cardiff „ -	—	—	—	—	—	—	—
Total, April 1st, 1890 -	446	13	1,264	74	115	189	616
Lost, &c. since April 1st, 1889	8	—	186	3	3	31	91
At opticians - - -	26	—	14	—	—	—	2

APPENDIX VI.

List of Stations reporting Meteorological Observations to the Office by Telegraph on 31st March 1890, with the Names of Observers.

*†Sumburgh Head	Rev. W. Brand	Minister of Dunrossness.
*†Stornoway	J. Forbes	Nicolson Institution.
Wick	J. Sinclair	Watchmaker.
Nairn	Miss Penny	Schoolmistress.
*†Aberdeen	W. Boswell	Assistant at the Observatory.
Leith	W. Hay	Telegraph Clerk.
*†Shields	J. W. Irvine	Do.
Spurn Head	J. H. Watson	Lightkeeper.
†York	H. M. Platnauer, F.G.S.	Curator of Museum.
Loughboro'	W. Berridge	——
†Ardrossan	J. W. Mayes	Telegraph Clerk.
Malin Head	O. O'Doherty	Signalman, Lloyd's.
*†Mullaghmore	K. Kerr	Retired Coastguard Officer.
*†Belmullet	Miss M. J. Tolan	Telegraphist.
†Donaghadee	T. MacGowan	Postmaster.
Parsonstown	E. Haines	Assistant Observer at Lord Rosse's Observatory.
*†Holyhead	Capt. Richards	Keeper of Sailors' Home.
Liverpool	J. Hartnup, F.R.Met.Soc.	Bidston Observatory.
*†Valencia	J. E. Cullum, F.R.Met.Soc.	Superintendent of the Observatory.
†Roche's Point	W. Kennedy	Telegraph Clerk.
Pembroke	S. Blake	Lightkeeper.
*†Scilly	A. Hicks§	Signalman.
Prawle Point	W. Hewitt	Coastguard Officer.
†Hurst Castle	G. G. Appleton	Lightkeeper.
†Jersey	J. Fisher	Station Master.
*†Dungeness	W. Batton	Assistant Lightkeeper.
*†London	F. Gaster, F.R.Met.Soc.	Clerk, Meteorological Office.
Oxford	W. Wickham	Radcliffe Observatory.
Cambridge	H. Todd	Observatory.
*†Yarmouth	G. T. Watson	Secretary, Sailors' Home.
‡Hawes Junction	W. H. Bunce	Station Master.

In addition to the above reports are received daily from the following Continental Stations.

Station.	Authority.	Station.	Authority.
Haparanda	Meteorological Office, Sweden.	†The Helder	Bureau Central Météorologique, Paris.
Hernösand		Cape Gris Nez	
†Stockholm		†(Brest, St. Mathieu)	
Wisby		Lorient (Île de Groix)	
Bodö	Meteorological Institute, Norway.	*†Rochefort (Ile d'Aix)	
†Christiansund		†Biarritz	
*†Skudesnaes		†Paris	
Faerder		Belfort	
†The Scaw	Meteorological Institute, Denmark.	Lyons	
Fanö		Nice	
Cuxhaven	Deutsche Seewarte, Hamburg.	Perpignan	
		Berlin	Cent. Met. Inst. of Germany.
		Wiesbaden	
		Munich	
		Corunna	Observatory, Lisbon.
		†Lisbon	

Note.—Those stations marked with an asterisk (*) report also at 2h. p.m.; and those with a dagger (†) at 6h. p.m.; Lisbon reports at 8h. a.m. and 4h. p.m.

‡ This station now reports by post only.

§ W. Thomas died in March 1890.

The reports from Barrow-in-Furness ceased at end of 1889.

APPENDIX VII.

Report of Inspections, Ireland and Wales.

Gentlemen,

I have to report that I have completed the inspection of the Irish and Welsh stations, and have also visited the fishery barometers which lay in my way.

Telegraph Stations.

Holyhead, visited August 6.—I found this station in good order. No remarks are called for.

Donaghadee, visited August 7.—This station was also satisfactory. I regret to say the health of the observer is not good.

Malin Head, visited August 12.—The new observer, Owen O'Doherty, is more satisfactory than his predecessor, J. Farren, and I hope that the station will now be useful. The instruments were in good order.

Mullaghmore, visited August 13.—This station was, as usual, in very good order.

Belmullet, visited August 15.—The instruments were all in good order and the station satisfactory.

Valencia, visited August 22, and found in good order. I authorised some necessary repairs to be carried out at the observatory.

Roche's Point, visited August 26.—The instruments were in fair order; the wet bulb was not satisfactorily mounted.

Parsonstown, visited August 28.—The observer, Haines, is attentive, and does his duty well.

St. Ann's Head, visited September 2.—This station was in good order.

Stations of the Second Order and Weekly Weather Report Stations.

Armagh, visited August 8.—Dr. Dreyer was absent, but I saw Mr. Faris, his assistant. The instruments were in proper order.

Colebrooke, visited August 9.—The instruments were in order. It is possible that this station may be discontinued.

Londonderry, visited August 9.—The station calls for no remark.

Markree, visited August 14.—The station was, as usual, in good order.

Currygrane, visited August 17.—The new assistant, F. Warrington, continues to work well.

Killarney, visited August 24.—The observer was absent, but the substitute was efficient and the instruments in good order.

Foynes, visited August 27.—These observations are only carried on while Lord Monteagle is residing at the place.

Parsonstown, visited August 28.—The observer, Sergeant Whelan, is failing in health.

Dublin (*Fitzwilliam Square*), visited August 29.—The station continues in excellent order.

Dublin, Glasnevin, visited August 29.—The only matter calling for remark is that the new gauge which was supplied in 1888 shows a larger fall than the old one; owing to difference of situation. I have directed the observer to discontinue the use of the old gauge.

Dublin, Mountjoy, visited August 29.—The only matter calling for notice is that it has been found that the anemometer, though on a high stage, registers 40 per cent. less than Holyhead.

Kilkenny, visited August 30.—The instruments were in good order, but there is no prospect of the station becoming one of the Second Order.

Waterford (*Brooklawn*) visited August 31.—This station, like Foynes and Kilkenny only takes readings for the Weekly Weather Report.

St. David's, visited September 3.—This station was, as usual, quite satisfactory.

Llandovery, visited September 4.—This also is only a station for the Weekly Weather Report; as such, it is fairly satisfactory.

I visited also certain fishery barometers which lay on my route. These were Ballyglass (Broadhaven), Ballycastle (Co. Mayo), Howth, Malahide, Hakin (Milford), and Angle, Milford Haven. At the last-named station the barometer has been exposed to weather. The instrument is serviceable if not moved about.

At several of these stations lectures would be appreciated.

(Signed) ROBERT H. SCOTT.

The following table shows the results of the thermometric comparisons:—

Corrections to be applied to the readings of—

STATIONS.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare Therm.	Remarks.
STATIONS OF THE SECOND ORDER.						
Armagh	−0·3	−0·5	−0·9	—	—	Grass min. 2°·5 of spirit separated.
Brookeborough	−0·2	−0·7	−0·1	+0·2	—	
Dublin (City)	−0·3	−0·4	−1·1	−0·3	—	
Dublin (Phœnix Park)	−0·9	−1·0	−0·3	−0·3	−1·0	Grass min. −1·6.
Edgeworthstown	−0·5	−0·3	−0·3	+0·6	—	Do. +0·7.
Glasnevin	−0·6	−0·5	−1·0	0	—	Do. −1·0.
Londonderry	−0·3	−0·2	+0·2	+0·3	−0·3	
Markree Castle	−0·7	−0·7	−0·2	−0·1	—	
Parsonstown	−0·8	−0·1	−0·8	−0·3	—	
St. David's	−0·7	−0·7	−0·4	−0·1	—	
TELEGRAPHIC REPORTING STATIONS.						
Holyhead	−0·2	−0·4	−0·6	−0·1	−0·6	
Malin Head	−0·1	−0·9	+0·1	−0·3	−0·4	New observer:
Mullaghmore	−0·5	−0·6	−0·4	+0·4	−0·6	
Belmullet	−0·6	−0·5	−0·4	−0·5	—	
Donaghadee	−0·8	−1·1	−1·1	−0·4	−0·7	
Parsonstown	−0·8	−0·1	−0·8	−0·3	—	
Valencia	−0·8	−0·5	−0·5	−0·1	+0·2	
Roche's Point	−0·9	−0·8	−0·8	+0·2	—	
St. Ann's Head	−0·2	0·0	0·0	+0·3	−0·1	
WEEKLY WEATHER REPORT STATIONS.						
Londonderry	−0·4	−0·3	+0·1	+0·2	−0·4 Grass. Ther.	
Armagh	−0·4	−0·6	−1·0	?	−0·3	Casella's mercurial min.: —not read. 2·5 of spirit separated in grass. min. — ther.
Colebrooke	−0·3	−0·8	−0·2	+0·1	—	
Markree	−0·7	−0·7	−0·2	−0·1	—	
Edgeworthstown	−0·5	−0·3	−0·3	+0·6	— Grass Min.	
Dublin	−0·3	−0·4	−1·1	−0·3	−0·3	
Kilkenny Castle	—	—	0·0	−0·2	—	
Waterford	−0·7	−0·8	+0·1	+0·2	—	
Killarney	−0·2	−0·2	−0·1	+0·2	—	
Foynes	−0·7	—	−0·5	+0·3	—	
Llandovery	—	—	−1·5	0·0	—	

Report of Inspection of the Scottish Stations for 1889.

Barometers.

The inspector's mercurial Standard Barometer No. 690 was used for this year's inspection tour. The results of the inspection of the station barometers are given in the following table. The barometers were found to be in good order, and continue to be observed with the same care and accuracy as in former years.

Stations.	Inspector's Standard, corrected.	Not corrected.		Remarks.
		Rep. Baro.	Check Baro.	
	ins.	ins.	ins.	
Fort William	29·689	29·680	—	
Fort Augustus	29·945	29·943	—	
Glencarron	29·237	29·237	—	
Stornoway	29·908	29·904	29·901	
Swanbister	29·678	29·688	—	
Dunrossness	29·560	29·554	29·558	
Wick	29·186	29·180	29·142*	* Read 15 min. later in house at higher level.
Nairn	29·560	29·558	29·559	
Aberdeen	29·715	29·715	29·712	
Braemar	28·891	28·878	—	
Dundee	29·734	29·730	—	
Ardrossan	30·026	30·020	—	
Pinmore	29·986	29·992	—	
Glenlee	29·736	29·748	—	
Leith	29·264	29·260	—	
Marchmont	29·118	29·118	—	
Ochtertyre	29·415	29·424	—	

Thermometers.

The thermometers in use at the stations were compared in water with Standard Thermometer No. 4433. The following table gives the corrected readings of the standard thermometer and the errors of each instrument as determined by the comparisons.

Stations.	Standard No. 4433, corrected.	Dry Bulb.	Wet Bulb.	Spare Thermometer.	Max. Thermometer.	Min. Thermometer.	Time in Water in Minutes.	Change of Temperature.	Remarks.
	°	°	°	°	°	°		°	
Fort William	57·8	0·0	+0·2	—	+0·2	−0·1	40	Uniform	
Fort Augustus	58·3	+0·1	+0·1	—	0·0	−0·4	60	Do.	
Glencarron	57·1	0·0	−0·1	—	0·0	−0·2	90	Do.	
Stornoway	57·6	+0·5	+0·6	+0·4	−0·2	−0·4	150	Do.	About 0°·2 of min. ther. at top of tube.
Swanbister	59·1	+0·1	+0·1	+0·8	−0·2	−0·4	90	+0·2	
Dunrossness	59·2	+0·4	+0·4	—	+0·2	−0·9	200	+0·2	
Wick	58·6	+0·4	+0·4	—	−0·3	−0·4	70	Uniform	Put right.
Lairg	57·0	+0·2	+0·2	—	−0·2	0·0	60	Do.	
Nairn	55·8	+0·7	+0·7	+0·1	0·0	+0·9	80	+0·3	In reading 1°·0 is subtracted from min.
Aberdeen	56·3	+0·2	+0·1	—	0·0	+0·1	90	Uniform	
Braemar	55·3	+0·5	+0·4	—	0·0	−0·1	70	Do.	
Dundee	58·7	+0·5	+0·5	—	+1·3	−0·3	90	+0·4	
Ardrossan	51·5	+0·2	+0·3	—	−0·2	−0·2	120	Uniform	
Pinmore	50·6	+0·2	+0·4	—	−0·1	+0·1	90	+0·2	
Glenlee	51·5	+0·2	+0·2	—	−0·3	0·0	140	Uniform	
Leith	50·0	+0·1	+0·4	—	+0·1	−0·6	50	Do.	
Marchmont	51·0	−0·3	−0·2	—	0·0	0·0	225	+0·5	
Ochtertyre	49·9	0·0	0·0	—	+0·6	0·0	130	Uniform	

As requested by the Office, the minimum thermometers were very specially examined, and only at Stornoway was this instrument found out of order. The quantity which was lodged in the top of the tube directly under the clamp was only 0°·2. This was rectified in presence

of the observer, who was at the same time instructed how to put it right if it should in future get out of order.

Neither the maximum nor minimum thermometer at Dunrossness is etched on the stem. As regards the minimum thermometer, the fiducial points 32°, 62°, and 92° are only very slightly above the corresponding points of the attached scale, certainly not more than two-tenths. The large error of this thermometer, about a degree, is therefore due to a faulty construction, or to some change in the mass of the fluid, or internal capacity of the tube since its graduation. Both this station and Nairn should be supplied with new minimum thermometers. At Nairn the practice has been to subtract a degree from each reading of the minimum thermometer, whereas at Dunrossness, where the error is equally great, the readings are telegraphed as made.

Hygrometers.

Again on this inspection, the dry and wet bulbs were read instantly on opening the thermometer screens, and in all cases the arrangements for correct hygrometric observations were satisfactory.

Notes on the Stations.

Fort William, August 6, 1889.—The instruments were all in good order and observed correctly and with care.

This is the low-level station at which observations have been made five times daily by Mr. Livingstone since the opening of the Ben Nevis Observatory in 1883.

The building of the low-level observatory was in progress, and it was expected that it would be finished about the end of October. A delay of from three to four weeks has been occasioned by the drought of last summer, owing to which the stones brought from Elgin could not be conveyed through the Caledonian Canal, but had to be taken round Cape Wrath to Fort William.

Fort Augustus, August 7.—The instruments were in excellent order and observed with great care and intelligence. The one or two omissions of observations, which recently occurred were occasioned by the new official duties of Father Martin. In future all the observations will be taken by the new observer, Father Cody. A new sunshine recorder has been erected in an excellent position.

Glencarron, August 9.—Everything, including the Richard thermograph and barograph, were in excellent order, and well read and attended to. A new sunshine recorder has been erected, constructed for the latitude, and with the usual three stages. The house of Glencarron shelters the instrument from the sun before setting behind the hills about midwinter; and during the summer months the sun sets behind the hills about 6 p.m.; but the exact times will be observed in the course of the year.

Stornoway, August 12.—As the clamp of the minimum thermometer is just over the top of the tube, any evaporated spirit lodged here cannot be seen. A gas flame was applied to it and the result showed that two-tenths had been evaporated. All the other instruments were in good order, and very well observed.

A misunderstanding on the part of Mr. Forbes had seriously limited the number of cases of variations of pressure inserted in his daily telegraphic reports. He now quite understands what is wanted and how to handle the aneroidogram, so that his daily report will show the more

marked changes of pressure, and the non-instrumental phenomena of storms, for which the help of his assistants and others will be enlisted.

Swanbister, August 14.—The instruments were all in the best order, and very accurately observed.

Dunrossness, August 17–19.—Everything was in excellent order, and the observations are made with great care and accuracy. Neither the maximum nor the minimum thermometer has its stem engraved. As regards the minimum, which reads nearly a degree too low, the three fiducial scratches on the stem are each about 0°·2 above these readings; the instrument has therefore been in error from the beginning.

Wick, August 20.—The instruments were in very good order, and the observations taken by both observers with accuracy and despatch. The rain-gauge had been recently repaired and is now in good order.

Lairg, August 21.—The instruments were removed in May from their old positions to the house and garden of the new observer, Mr. Young, of the public schools. The new positions are very good. A new rain-gauge and supports for the thermometer screen are required, which will shortly be supplied, otherwise the instruments were in good order and are well observed. The height of the new station is 335 feet.

Nairn, August 22.—The instruments were in excellent order, and the observations well taken by all the observers.

Aberdeen, August 24.—All the instruments were in very good order and are well observed.

Braemar, August 27.—The instruments are well kept and observed. Since, however, they have been in use for the long period of 33 years, it is desirable that some changes and repairs be made, which are now being attended to.

Dundee, August 28.—The instruments continue to be thoroughly well kept, and the observations carefully and correctly made.

Ardrossan, September 30.—The Stevenson screen required pretty extensive repairs and repainting, which were ordered to be done. The rain-gauge has been repaired, but is not quite firmly fixed, this was to be done on the following day. Otherwise the instruments were in good order, and very intelligently observed. On the two days when the wet bulb was found to be dry, the cup of the hygrometer had been upset. The observer was told what to do should this recur. As Mr. Mayes is now settled in Ardrossan, satisfactory arrangements will shortly be made for making the 10 p.m. observation. The new assistant read the instruments correctly, and made up the telegram also correctly.

Pinmore, October 1.—The instruments were all in excellent order, and are very carefully observed. As explained in previous reports, this station is situated in a rather deep valley, only from 150 to 300 yards in breadth, and virtually shut in on all sides. The instruments are in an open position in the garden, but all round there is much fine old wood. Thus the prevalent calms are a striking feature of this limited district, as also are the rapid fall of temperature in the early evening and the rather frequent frosts.

Glenlee, October 2.—The instruments were in particularly good order, and are observed with much care and intelligence.

Leith, October 10.—The supports of the thermometer screen and the enclosure for the instruments require to be repaired and repainted, and orders were given to have this done. Otherwise the instruments were in very good order, and the observations are made with much care and intelligence.

Marchmont, October 11–12.—All the instruments were in particularly good order, and the observations are made with intelligence and accuracy. The following additional instruments are at this station:—Maximum and minimum black bulbs; a minimum thermometer suspended outside the thermometer screen; three underground thermometers; a second rain-gauge, 12 inches square, with its rim 15 inches high; a glycerine sunshine recorder, designed by Mr. Loney, and an aneroidograph.

Ochtertyre, October 17.—All the instruments were in singularly good order, and observed with great care and intelligence. The following additional instruments are at this station:—A complete set of duplicates of thermometers and rain-gauge; three underground thermometers at depths of 3, 12, and 22 inches; maximum and minimum exposed thermometers.

(Signed) ALEXANDER BUCHAN.

REPORT of INSPECTION of the ENGLISH STATIONS, 1889.

TELEGRAPHIC REPORTING STATIONS.

Dungeness, inspected June 7.—There appears to be some improvement in the observations taken at this station, but the wet-bulb thermometer was dirty and the bulb itself much crusted with lime. I found, by testing, that the water used on the day of my visit was hard. There is a rather large difference between the corrected readings of the reporting and check barometers, but the first-named instrument is correct. I question whether the lowness of the barometric readings, as frequently reported from this station, is due to carelessness on the part of the observers. As regards the low temperatures sometimes reported from Dungeness, I adhere to my opinion that these are correct, and are principally due to the character of the soil. The Dungeness temperatures give a very inadequate idea of the climatology of the neighbouring coast. The exposure of the station is, however, excellent.

Jersey (*St. Aubin's*), June 9.—The reports from this station continue to be very good. The situation of the sunshine recorder was at the time of my visit not very satisfactory. The instrument was sheltered in early morning and late evening in summer; and the extreme steepness of the slope on the summit of which it was situated, rendered it necessary for the observer to employ a substitute to attend to the instrument. I subsequently received a letter from Mr. Fisher, suggesting a new site, half-way between St. Aubin's and St. Brelade's, at the summit of the hill leading down into the latter village, where the exposure would be perfect, in the garden of a lady who promised to take charge of the instrument. After some correspondence, a personal friend in whose skill in such matters I have full confidence, the Rev. H. W. P. Yorke, of St. Helier's, removed the instrument to the new situation on November 20th.

I notice that, as anticipated, the summer maxima are higher than those reported when the thermometers were at Noirmont.

Hurst Point, June 12.—The instruments at this station were in good order. The thermometer screen much needed repairs and repainting, which has since been done. The observer still continues every now and then to make inaccurate reports.

Scilly (*St. Mary's*), June 15 and 16.—The observer, Mr. Thomas, was somewhat ill and unequal to taking accurate observations at the

date of my visit. I gave careful instructions to the observer's son (who frequently attends to the observations), as to reports of changes of pressure indicated by the self-recording aneroid, a matter of some importance at this station. Mr. A. Hicks continues to be at any time ready to assist in or to conduct the observations.

A new block was needed for the rain-gauge and was ordered.

The anemometer was in as good working order as usual, giving occasionally blurred anemographs, owing to the saltness of the water particles in the atmosphere. One of the clock wheels required much rubbing with emery, and needs more frequent lubricating. This I attended to.

Prawle Point, June 18.—The observations at this station, for which Mr. Mehegan seems to be almost entirely responsible, are very accurate, and are carefully reported. The minimum, No. 307, again contained exactly 0°·9 of detached spirit, a defect which had only recently recurred and for which the observer had applied a correction. By refrigerating the bulb and applying strong heat to the other end of the tube, I rectified the defect for the time.

Spurn Head, July 12.—The instruments at this excellent station are in good order, and the new lightkeeper appears to attend to them carefully, and to read them with accuracy. The station would be as faultless a one as could be found on our coasts, were it not for the drifting of the dry sand around the outdoor instruments.

Barrow-in-Furness, July 19.—Mr. Whitworth was absent from home on the day of my visit. The thermometers were in good order, but the wet-bulb was not clean. I only succeeded in expelling an exceedingly small bubble of air from the barometer tube. This tube has been since refilled and has been employed again since August 1st. A new rain-gauge had been substituted for the old one previously to my visit. The instrument is a good one and has a fair exposure. As regards the winds felt at this station, I may be permitted to refer back to previous inspection reports.

North Shields, July 24.—The barometers were in good order. They will probably have to be removed from their present site in the course of the coming winter, as new post office buildings are being erected. I have given full instructions as to their removal.

Dockwray Square is now open to the public, and is much employed for tennis. Children frequently meddle with the rain-gauge and have already injured it. The observer, Mr. J. Irvine, recommends that the outdoor instruments should be shifted towards the south-west corner of the Square, where they will be at a much safer distance from the entrance gate. I would suggest that the gauge should be surrounded by an iron fence, similar to that employed at York and some other places. Except this Square there appears to be no place in the immediate neighbourhood available for the outdoor observations.

York, July 26.—The barometer No. 156, employed as the reporting instrument at this station was last year supposed to be out of order, and No. 138 was sent down for employment either instead of, or to check, the readings of the former instrument. The observer reported No. 138 to be also out of order. I found both 156 and 138 to be in perfect order. I recommend that the old barometer should be retained as a reporting barometer, and No. 138 as a check for the present; but it will perhaps be better that No. 138 should eventually be used as the reporting instrument.

Yarmouth, September 18.—The observations taken at this station continue to be in all respects satisfactory, and I found all the instruments in good order.

Cambridge, September 18.—The instruments were all in good order. The low wind velocities characteristic of this station are, in all probability, as I have previously mentioned, the result, to a great extent, of the wooded character of the country round Cambridge.

Oxford, September 19.—The reports from this station are very good, and I found all the instruments in a satisfactory condition. There is a slight deposit on the wet-bulb.

Loughborough, September 27.—The observer had to leave his house on business almost immediately after my arrival, and I therefore could not on this occasion compare his readings of the instruments with my own. The standard barometer having been conveyed in a warm railway carriage and omnibus, had a much higher temperature when suspended than the reporting barometer at the station. I had also to suspend the former out of doors, not finding a place which I liked to avail myself of within the house, and the sun shone occasionally on part of the instrument. At the time of comparison the attached thermometer of the standard read 3°·9 higher than that of the reporting barometer. Correcting to equivalent temperatures the standard read 0·021 in. above the observer's instrument, but as I do not consider the comparison satisfactory I have entered no figure in the table. All the other instruments were in good order, and no observer could be more punctual and painstaking than Mr. Berridge. The thermometer corrections are not in accordance with my expectations.

The following, which are not Telegraph Reporting Stations, were inspected by me this year.

Eastbourne, June 8.—The observations at this station are good, and I found all the instruments to be in excellent order. The sunshine recorder has been raised 1 foot and erected on the middle of the turret (instead of on one side) upon a substantial pedestal. The observer undertook to send the readings of the solar radiation thermometer on overcast days, which had not hitherto been done. The station, which is in the hands of the Town Council, seems likely to be permanently maintained.

Plymouth, June 13.—Dr. Merrifield was absent at the time of my visit. The instruments were in good order. The rain-gauge occupies a much better site than that which it had at the Navigation School. The sunshine recorder had a very fair, but not absolutely perfect, exposure. It required a trifling adjustment. The old screen is in use, and is a wall screen. The observations appear to be carefully conducted.

Prestwich, July 13.—Dr. Clunn, who superintends the observations for this station, was much engaged at the time of my visit, and the observer who usually takes the readings was absent. The returns from this station unfortunately continue to be greatly in arrear. The barometer is correct. The outdoor instruments are excellently situated. The thermometers were compared in 1878 in melting ice, and the corrections then obtained were assumed to vary as the old Kew corrections throughout the scale, but at 55° the 1878 corrections are (if my comparisons this year were correct) inapplicable.

Isle of Man (*Cronkbourne*), July 21.—Mr. Moore was absent at the time of my visit. His deputy takes the observations with great accuracy. The instruments were in excellent order, with the exception of the grass minimum, the tube of which contained 2°·7 of detached

spirit, which I restored. Mr. Murphy had applied an additive correction of 2° since noticing the defect. The returns from this station are good.

Isle of Man (*Douglas, Prospect Hill*), July 22.—Since my inspection of this station in 1887 all the outdoor instruments have been moved to a new site about 70 yards from their former position, but on the same level. The ground now occupied by them affords an improved, though not absolutely perfect, exposure. The barometer is not a reliable instrument. It had at the time of my visit a considerable error, but I re-adjusted the tube on the scale so that it read correctly when I left the station. The thermometers were in good order; and the returns appear to be carefully attended to.

Newton Reigny, July 22.—This is a most excellent station. All the instruments were in admirable order, and the returns are very complete and accurate. The sunshine recorder has an almost perfect exposure. Mr. Benn and his assistant are most careful in the attention bestowed on the observatory.

Seaham, July 25th.—The instruments at this station were found to be in good order, except that there was a considerable deposit on the wet bulb, the muslin of which requires to be very frequently changed, The corrections of the dry and wet-bulb thermometers, as determined by me this year, differ from those obtained in previous years, but the old corrections may advantageously be retained for the present. A new door was required for the screen, which also needed to be re-painted. Mr. Aird had the repairs attended to directly after my visit. The returns from this station are satisfactory.

Durham, July 25.—I found all the instruments at the observatory in very good order, except the grass minimum, which contained 1°·3 of detached spirit. A correction of this value has been in use. The returns from Durham are good and complete.

York, July 25 and 26.—The thermometers were in good order. The returns from the station are fairly good. I do not, however, consider the observer to be entirely trustworthy as regards punctuality and accuracy.

The sunshine recorder is still kept at the Friends School, Bootham. There is some little difficulty in getting it well and punctually attended to during the vacations, but the records are on the whole satisfactory. Mr. R. Thompson expressed his willingness to take the instrument into his own charge at his new residence (Dringcote), should the change be considered desirable. The question may, I think, be deferred till next inspection.

Oswald Kirk.—The sunshine recorder at this place is the property of Mr. R. Thompson. It is well attended to, but the exposure is not quite perfect.

Epsom, September 17.—It being still vacation at the Royal Medical College, the observer was absent. His substitute appeared to require a little instruction in reading the barometer. The instruments were in good order. Errors of reading and reduction are still noticeable in the returns from this not unimportant station. The barometer, when the correction for index error has been employed, reads ·009 too low.

Rugby, December 9.—The returns from this station are still of little value, as the a.m. readings of the barometer are not punctually taken, and the outdoor observations are left to Mr. Kirk, the gardener, whose observations of wind and cloud appear to me of no value. He reads the thermometers well; and all the instruments (except the rain-gauge,

which is nearly worn out) are in excellent order. The barometer is inconveniently situated. I have advised that the rain-gauge be shifted to the south-east of its present position (where it is slightly sheltered), and be repaired. I have but little hope that the returns from this station can, at least for some years to come, be usefully employed, as the school arrangements interfere with the punctual performance of the meteorological work.

Sutton Coldfield, December 31.—The returns from this station have been until lately considerably in arrear, but there is, I think, every prospect of their now being punctually attended to. There has been some falling off in punctuality since Mr. Fletcher left the station. However, Mr. Marston, the new observer, promised me to pay full attention to the work. His assistant, Mr. J. H. Smythe, read the instruments with great accuracy. The Jordan's sunshine recorder is on the south corner of the roof of the municipal buildings; it has an admirable exposure, but the time-lines do not seem correctly printed. Barometer is a Fortin by Bailey of Birmingham. It is certified as having a very small error, but at 29·80 it read ·005 lower than my standard. The outdoor instruments were situated in Mr. Fletcher's garden, where the position is very good. Mr. Marston informed me that they would shortly have to be moved into his own garden, where the position is by no means so well exposed. The removal actually took place, as I am informed, on January 6th. The observer promised to have the screen, which has hitherto been of a green colour, painted white on the date of its removal.

The following table gives the results of the comparisons made by me in 1889, and contains its own explanation. The barometer employed by me as a standard up to July 24th was the contracted Adie No. 216. The tube up to the time of its unfortunate breakage at Newcastle remained free from air. After that date I employed as a standard the uncontracted Adie No. 590, which has also kept in excellent order. The results of the thermometric comparisons may be, I think, regarded as fairly satisfactory. The rain-gauges were all found in good order except in those cases mentioned in this report. The same remark may be made of the sunshine recorders. But to these latter instruments I intend to devote a separate and minute investigation in the course of the present year. At one station only of those this year inspected was the barometer tube found to contain air. In three only was the thread of spirit in the minimum thermometer found to be broken, and in none of these had the defect escaped the observer's attention. Care as regards the cleanliness of the wet-bulb and accuracy in reading thermometers to the tenth of a degree, show an unmistakable improvement.

| Name of Station. (The Names of the Telegraphic Reporting Stations are in *Italics.*) | Barometer. | | Thermometer. | | |

Fishery Barometer Stations.

At the desire of the Secretary, I visited a few Fishery Barometer Stations this year.

On June 10th I visited the harbour-master at *Gorey*, Jersey, in hopes that the thick and rough weather prevailing might enable me to get together an audience of fishermen. In this I was unsuccessful, perhaps on account of the heavy rain. The number of fishing boats now kept at this station is very small, and is rapidly decreasing. The fishery barometer reads low, but contains no air.

I convened a meeting of fishermen on the morning of Saturday, July 20th, at *Port St. Mary*, Isle of Man. The weather was all that could be desired, being thick and wet with an E.S.E. wind. I lectured for about 80 minutes to about 30 men, many of whom, especially the younger, appeared very attentive. Mr. Luattrough, the harbour-master, gave me every assistance. The fishery barometer at this station read 29·720 at 60°·2, while my standard read 29·710 at 60°·5. The fishery barometer is well placed, and the tube is free from air.

On the same day in the afternoon I gave a lecture to about 30 men in the Sailors' Rest at Peel. The men were most attentive; some of the older men held peculiar tenets as to the action of the barometer. The weather was most propitious, enabling me to foretell as probable the strong N.W. breeze which burst over the island the following afternoon. The fishery barometer is well situated on the pier close to the Sailors' Rest, and a few yards from the harbour-master's offices. The instrument (184) read 29·605 at 64°·9. The standard suspended by me within the building at the same elevation read 29·608 (corrected for index error) at 65°·5. The Kew certificate gives ·000 as index error for No. 184.

The case of the cistern of the fishery barometer is much coated with rust externally.

I am of opinion that a short manual or guide to the use of the fishery barometer, containing knowledge brought up to date, expressed in language suitable to the attainments of our fishermen, would form a useful treatise, and be fully appreciated by the majority of those for whom it would be intended.

(Signed) W. Clement Ley.

Report on Inspections of the Self-recording Observatories and Anemograph Stations.

The *Valencia Observatory* was visited from July 29th to August 2nd. The instruments were all inspected and found in good order, the clocks of the barograph and thermograph being cleaned and the light shutters re-adjusted. The anemograph required painting externally, which would be done after inspection, and the direction shaft inside the observatory was loose at some of the joints. It was tightened up, and new pins put in to make it fast. A slight want of repair in the thermograph screen was pointed out to Mr. Cullum.

The mercury in the Beckley gauge was taken out, cleaned, and replaced, with the addition of a quantity of fresh metal to supply a certain amount which had been lost.

The usual comparisons of the thermograph thermometers with the observer's standard, K.O. 682, were made with the following results:—

Dry, No. 399, correction at 60°	-	-	-	—0°·6
Wet, „ 398, „	-	-	-	—0·5
Max., „ 1003, „	-	-	-	0·0
Min., „ 2497, „	-	-	-	—0·2

The *Armagh Observatory* was visited from August 5 to August 7. In the absence of Dr. Dreyer, the director, I was received by the Rev. E. Faris, who was in charge.

The anemograph was found to be much choked and corroded with bad oil, which has been employed for its lubrication; this, however, was removed, and the bearings cleaned. Unfortunately, the new sperm oil purchased by the Meteorological Office for the especial purpose of anemometer oiling had not arrived at the time of my visit, and I was compelled to make use again of the unsatisfactory lubricant in the absence of better.

The Beckley rain-gauge was cleaned, the mercury filtered, and the lifter re-adjusted, all being in satisfactory condition.

Falmouth Observatory, visited August 10 to 15. On examination I found the anemograph, barograph, rain-gauge, and thermograph all in first-rate order, and merely requiring the usual cleaning and oiling, which operations were duly performed.

The thermometers were compared with my standard, and the corrections found to be as follows:—

Dry, No. 383, correction at 63°	-	-	-	°	0·5
Wet, „ 388, „	-	-	-		−0·4
Max., „ 104, „	-	-	-		−0·5
Min., „ 308, „	-	-	-		0·0

The thermometer attached to the standard barometer still requires a correction of −0°·7; this, however, is never applied to its readings, the observers not having received official instruction to do so.

The anemograph at the *Holyhead* pier-head was inspected whilst a gale was blowing on July 24, and therefore was not dismounted.

It was found to be in very good order both inside and outside, all the bearings appearing to be well oiled and quite free. The pins of the connecting shafts were, however, nearly shaken out and had to be driven home tight. I called the attention of Mr. Hugh Williams to them in order that they may be watched in case they should loosen again.

The *Phœnix Park* anemograph, visited July 25, was found working well and in excellent order. The vane bearing, however, has been running in glycerine instead of oil, and this, by absorbing water freely, causes a constant dripping of greasy matter on the curves, which produces a disfigurement.

I suggested the suspension in future of a small zinc cup beneath the bearing in a position to catch the drops.

(Signed) G. M. Whipple.

(M.O. 1951.) Kew Observatory,
October 1889

Dear Sir;

I have the honour to hand you herewith my report and inspection notes regarding the self-registering instruments at the following observatories, Stonyhurst, Glasgow, and Aberdeen, and also the anemograph station at Fleetwood.

(Signed) T. W. Baker.

To R. H. Scott, Esq., F.R.S.

Stonyhurst, visited September 17–18.—Here all the instruments were working satisfactorily.

The thermograph and barograph had their clocks, lenses, and fittings cleaned, after which the various thermometers were compared at 55° by means of Kew Standard No. 682, and the following corrections determined :—

Dry, Standard 619	−0°·1
Wet, „ 382	−0·3
Maximum, M.O. 439	−0·3
Minimum, M.O. 501	+0·1

The anemometer was entirely dismounted, and although found in excellent condition the different parts were cleaned, and fresh oil applied to all the bearings. Afterwards the orientation was tested and found correct.

Mr. Carlisle informed me that the barometer now in use for the control observations is not very satisfactory, the residual corrections varying considerably according as to whether the mercury is rising or falling.

The sunshine recorder is fixed to a stone balustrade about 4 feet above the roof of the magnetic chamber, and is properly adjusted both as regards time and level. A shadow, however, is cast upon it for a few minutes at 2 p.m. during a part of December by the finial ornament fixed on top of a summer house about 30 yards distant south-west, otherwise the exposure is good all the year round.

Glasgow, visited September 20–21.—According to the usual practice the thermograph and barograph clocks were cleaned as well as the other instrumental parts. Cardboard shields were fitted to the thermograph lenses in order to keep reflected light from discolouring the photographic sheets.

The zero lines were changed to the winter position, and the various thermometers compared and found to require the following corrections at 50° :—

Dry, Standard 550	−0°·1
Wet, „ 472	−0·4
Maximum, 58,846	+0·1
Minimum, 63,942	−0·1

The grass minimum (59003) read low by 0°·6, but this was owing to a small quantity of spirit which had become detached from the main column and lodged in the upper portion of the tube. After putting the instrument in order the correction was found to be +0°·1.

The barograph thermometer requires a correction of −0°·8, and the attached thermometer to the standard barometer −0°·5.

As regards the anemometer, the instrument was completely dismounted and cleaned, and fresh oil applied to all its bearings. The clock was also examined and a new line attached.

The orientation was then tested and the sheet containing the result accompanies this report.

New lines were attached to the rain-gauge clock and the usual cleaning performed.

The sunshine recorder is very well placed on the roof of the observatory, and has a good exposure all the year round. It is also properly adjusted for the time and level, but the surface of the glass sphere is somewhat corroded, though it does not appear sufficient to diffuse the light to such an extent as to blurr the solar image on the card.

Aberdeen, September 24–27.—The various instruments at this observatory were in very good order.

My special attention having been called to the stray light which at times was very marked on the thermograph sheets, I dismounted both the dry and wet thermograph tubes and applied several coatings of lamp black mixed with varnish to each tube, after which cardboard shields were fitted to both lenses, and subsequent curves seem to show that the light has been now effectually excluded.

Both the barograph and thermograph clocks as well as the lenses, &c. were cleaned.

The barograph mahogany case did not fit very well, having become slightly warped; this I had put right.

According to instructions the thermometers were tested in pounded ice, and the following corrections were determined at 32° :—

Dry, Standard 397 - - - - -	—0°·1
Wet, „ 395 - - - - -	—0·6
Maximum, 1,002 - - - - -	0·0
Minimum, 5,056 - - - - -	0·0
Attached thermometer (to Standard barometer) No. K.O. 71,061 - - - - -	—0·3
Barograph thermometer (no number) - - - -	—2·0

The external portions of the anemometer were dismounted, and all parts cleaned and fresh oil applied, but the clock and recording apparatus only required oiling. Afterwards the orientation was examined and found satisfactory.

"Squeezes" were taken of both the self-registering and spare rain-gauges.

The Beckley gauge was in excellent order, as well as the clock.

Fleetwood, October 1–2.—On dismounting the anemograph at this station it was found that the oil in the direction bearing had become very thick and hard, but in the velocity bearing it was in a much better condition. The instrument was thoroughly overhauled, and all parts cleaned and fresh oil applied. After remounting it was oriented.

The clock was taken to pieces and cleaned and new lines attached.

(Signed) T. W. Baker.

APPENDIX VIII.

Method of Dealing with Telegraphic Weather Intelligence.

The operations connected with the preparation and issue of the Forecasts and Storm Warnings have not undergone any material change. The Daily Weather Report also has not been altered during the year.

The Office receives, when the telegraphic communications are perfect, fifty-eight* reports every morning, seventeen every afternoon (except

* The Reports from Barrow-in-Furness have ceased.

on Sundays), and twenty-nine each evening, the arrangement of which is explained in the reports for recent years.

At the British and Irish stations the morning observations are taken at 8 a.m. Greenwich time, and most of the telegrams arrive in London at about 9 o'clock, when the Intelligence Department of the Post Office extracts from them the portions required for its wind and weather reports. They are then transmitted to the Meteorological Office by its private wire.

Daily Weather Report.

No important change has been made during the past year in the *form* of the Daily Weather Report, a detailed description of which is given in the Annual Report for 1887. The Report still fills four large quarto pages, and contains on page 1 the whole of the 58 reports from which the maps for the day (given on page 2) are prepared, and the 6 p.m. reports of the previous day, together with the maximum and minimum temperatures of the air, and the rainfall for the previous 24 hours.

On page 2 are two maps, showing (1) for 8 a.m. the distribution of pressure, the prevalent winds, and the sea disturbance, with necessary explanations; (2) the distribution of temperature at 8 a.m., the weather at each station, and the distribution of rainfall during the past 24 hours. Tables are added, giving the means of pressure, temperature, and rainfall as heretofore.

Page 3 contains (1) notes on the "General situation at 8 a.m.," and the "Probable changes in system now prevalent;" and (2) the forecasts drawn up for each district at 11 a.m., relating to the weather likely to be experienced during the 24 hours ending at noon on the day succeeding that of publication, and an explanation of the meaning of the storm signals exhibited on our coasts.

Page 4 contains the observations made at 2 p.m. on the previous day, and "General Remarks on the Weather over Europe during the past 24 hours."

The standing portion of the report (maps, &c.) is printed in blue, while the information for each day is in black.

The subscription for the Report is —

For delivery by hand, where feasible, £2 per annum;
Do. by book post £1 „

MS. copies of the observations and remarks can be supplied at the rate of 2*l.* 10*s.* per annum. Arrangements can also be made for the supply of charts drawn from the 8h. a.m. or 6h. p.m. observations, such as appear in the "Times."

Correction and Addition List.

The following additional steps are taken to insure accuracy in the Daily Weather Report. Monthly returns are received, from nearly all of the telegraphic reporting stations, of all the observations which have been transmitted to London by wire. These are used for checking the daily telegrams, for the preparation of the average and other values of the different elements, and also as evidence in the case of legal proceedings. A lithographed sheet is then issued with the Daily Weather Report, containing corrections for all discrepancies which have been discovered, and supplying any observations which have been omitted in the daily reports.

Weekly Weather Report.

The Weekly Weather Report, which has appeared since February 1878, was rearranged at the commencement of 1890, and is now prepared for the conventional week, Sunday to Saturday, in order to bring it into agreement with other weekly publications. This enables it to be published on Thursdays instead of Saturdays. The three daily synchronous maps which it contains have also been greatly improved, the standing portion (showing the outline of the land and sea) being printed in blue, while the information on them is in black. These maps show (1) for 8 a.m., the temperature, weather, and sea disturbance; and (2) for 8 a.m. and 6 p.m., the distribution of pressure and the winds, over and on the coasts of Europe.

The Summary on the first page contains the average and extreme temperatures, the rainfall values, and the total amount of bright sunshine in each week for twelve districts in Great Britain and Ireland, together with the difference between them and the respective mean values for the corresponding week in previous years. The district values for Accumulated Temperature, Rainfall, and Bright Sunshine are also given, both for the week and for the whole period since the beginning of the year, with their differences from the average values. This information is derived from observations made at 76 stations, the individual values for which are now given on the second page of the Report.

The tables of Accumulated Temperature are designed to give persons engaged in agriculture better means of estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer. They show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively, of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard or *base temperature*. The base adopted is 42° F., as being nearly equivalent to 6° Cent. which has been considered by continental writers on these subjects to be the critical value, the temperature above which is mainly effectual in starting and maintaining the growth, and in completing the ripening of agricultural crops in a European climate. This base is also convenient as being 10° F. above the freezing point.

Accumulated Temperature is expressed in Day-degrees; a Day degree signifying 1° F. of excess or defect of temperature above or below 42° F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours.

An explanation of these rules will be found in the last Annual Report, and full details as to the facts on which the rules are founded are published in Appendix II. to the Quarterly Weather Report for 1878.

The temperature means, derived from the daily maxima and minima, are corrected so as to agree as closely as possible with the true mean daily value, and, the average values for the corresponding period in former years are:—

For Temperature	- -	20 years 1861–80
„ Rainfall	- -	20 „ 1866–85

The values for temperature, accumulated heat, rainfall, and sunshine for *each station** are given on the second page of each Report.

The Synchronous Charts referred to on page 17, with the daily Remarks thereon, occupy the third to sixth pages.

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* The sunshine values are furnished for only a limited number of carefully selected stations. See p. 103.

In addition to the reports from the Telegraphic Reporting Stations, and the returns from the self-recording Observatories, weekly returns from 43 volunteer observers are used, the names of the stations and observers being as under:—

Names of Stations.	Names of Authorities.
Alnwick Castle - - -	Lieut.-Col. F. Holland, for the Duke of Northumberland, K.G.
Arlington (N. Devon) - -	J. Carter, for Lady Chichester.
Bawtry (Hesley Hall) - -	B. I. Whitaker, J.P., F.R. Met. Soc.
Blackpool - - - ℳ	J. Wolstenholme.
Braemar - - - ℒ	J. A. Aitken, J.P.
Brookeborough - - -	Mr. Ferguson, for Sir Victor Brooke, Bt., F.L.S.
Cheadle - - - ℳ	J. C. Philips.
Churchstoke - - - ℳ	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester - - -	The Royal Agricultural College.
Cullompton - - - ℳ	T. Turner, J.P., F.R. Met. Soc.
Douglas (Isle of Man) - -	A. W. Moore, M.A., J.P.
Dublin - - - -	J. W. Moore, M.D., F.R. Met. Soc.
Durham Observatory - -	H. J. Carpenter.
Edgeworthstown (Currygrane) -	J. M. Wilson, J.P.
Fort Augustus - - ℒ	Rev. E. G. Cody.
Foynes - - - -	W. Ward, for Lord Monteagle, K.P.
Geldeston - - - -	E. T. Dowson, F.R. Met. Soc.
Glen Carron - - ℒ	D. D. Munro.
Glenlee - - - ℒ	G. Maxwell and W. Melville.
Hastings (St. Leonard's) - -	H. Colborne, M.R.C.S.
Hereford - - - ℳ	T. A. Chapman, M.D.
Hillington - - - ℳ	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Ingatestone - - - -	L. J. Petre, F.R. Met. Soc.
Kilkenny - - - -	H. Carlton, for the Marquis of Ormonde, K.P.
Killarney - - - -	The Ven. Archdeacon Wynne, F.R. Met. Soc.
Lairg - - - ℒ	J. Young, Ground Officer.
Laudale (Loch Sunart) - -	A. Fletcher, for T. H. G. Newton, M.A., F.R. Met. Soc.
Llandovery - - - -	J. Watkins, F.R. Met. Soc.
Llandudno - - - ℳ	J. Nicol, M.D., F.R. Met. Soc.
Londonderry - - -	J. Conroy, F.R. Met. Soc.
Marchmont - - - ℒ	P. Loney.
Markree Castle (Co. Sligo) - -	A. Marth, F.R.A.S., for Colonel Cooper, F.R.A.S.
Newton Reigny (Penrith) - -	T. G. Benn, F.R. Met. Soc.
Ochtertyre - - - ℒ	G. Croucher.
Oswaldkirk (sunshine only) - -	R. Thompson.
Plymouth - - - -	J. Merrifield, LL.D., F.R.A.S.
Prestwich (Manchester) - -	T. R. H. Clunn, M.D., F.R. Met. Soc.
Rothamsted - - -	Rainfall by Sir J. B. Lawes, Bart., LL.D., F.R.S., and J. H. Gilbert, Ph.D., F.R.S.; temperature by T. Wilson, F.R. Met. Soc.
Scarborough - - - ℳ	W. Robinson.
Southampton - - -	J. T. Cook, R.E., Ordnance Survey Office.
Stowell - - - ℳ	Rev. H. J. Poole, F.R. Met. Soc.
Strathfield Turgiss - - ℳ	Rev. C. H. Griffith.
Thurcaston (sunshine only) - -	Rev. T. A. Preston, F.R. Met. Soc.
Waterford (Brook Lodge) - -	C. Percival Bolton, J.P.
Westgate-on-Sea (sunshine only) -	J. Norman Lockyer, F.R.S.
Worksop (sunshine only) - -	H. Mellish, J.P., F.R. Met. Soc.

The returns marked "ℳ" are supplied through the Royal Meteorological Society, those marked "ℒ" are through the Scottish Meteorological Society.

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...North.
...South.

The remarks and forecasts are posted at the doors of the Meteorological Office, 63, Victoria Street, S.W., on week days,* for the inspection of the public. Copies, or extracts from them, are communicated under the conditions stated below, but no information which is not substantially included in them can be supplied.

Arrangements have lately been made for exhibiting on the front of the Office, a series of boards showing in large type the state of the wind, weather, and sea disturbance at six stations, situated on our S.E., S., and S.W. coasts. The stations selected are Yarmouth, Dungeness, The Needles, Scilly, Holyhead, and Valencia Island, and the observations posted up are those for 8 a.m. and 2 p.m. daily, except on Sundays.* The information can be easily read from the road.

FORECASTS FOR SUBSCRIBERS.—Any person can be supplied with a copy of the 11 a.m. Forecasts, once on each week day,* on payment of a subscription of ten shillings per annum, or 2*s.* 6*d.* per official quarter, *or any part thereof, in addition to the cost of transmission;* the charges will therefore be, by *letter* post, 9*s.*, by *book* post, 5*s.* 9*d.* per quarter.

The forecasts for any of the districts and for any of the hours mentioned on p. 90 can be forwarded by telegraph daily, on payment of 3*d.* per day for any definite period, in addition to the cost of telegraphy.

FORECASTS FOR CLUBS.—These are drawn up at 11 a.m., for all the districts, and are supplied to Clubs, for a subscription of ten shillings per annum. They are delivered free, by hand, to Clubs situated in or near Pall Mall. Special arrangements can be made for delivery at a greater distance by hand or by post.

FORECASTS FOR HAY AND CORN HARVESTS, OR FOR PUBLIC USE.—Special facilities are offered for the transmission of Forecasts for these purposes, a nominal fee of 2*s.* 6*d.* being charged for a quarter or any part thereof, in addition to the cost of the telegrams.

EXHIBITION OF TELEGRAPHIC FORECASTS AT LOCAL POST OFFICES.—The Post Office has sanctioned the exhibition of Forecasts at Local Post Offices, provided space is available, if the persons to whom they are addressed desire them to be so exhibited instead of being delivered.

Unless otherwise arranged, all forecasts transmitted by post are sent by book post, not as letters.

INQUIRIES as to the WEATHER.

INQUIRIES PERSONALLY OR BY MESSENGER.—Any person applying at the Meteorological Office between 11 a.m. and 8 p.m. on week days, and between 7 p.m. and 8 p.m. on Sundays, can be supplied, in writing, with the latest information in the possession of the Office and with the latest forecast issued for any specified district, on payment of one shilling for each inquiry.

INQUIRIES BY LETTER.—Application may be made by letter, enclosing thirteen pence in stamps if the reply is to be *by post*, and one shilling in stamps, in addition to the cost of the reply (consisting of ten words, exclusive of the address) if the reply is to be *by telegraph*.

INQUIRIES BY TELEGRAPH.—Any person may obtain *by telegraph* from the Meteorological Office the latest information as to the weather

* Good Friday and Christmas Day are reckoned as Sundays.

in any district of the United Kingdom by payment of a fee of 1*s.* in addition to the cost of a telegram and reply to any post office. The telegram containing the inquiry must be addressed as follows:

WEATHER,
LONDON.

The payment for the reply should be for at least ten words in addition to the address.

Application may also be made for similar information to be sent either *by telegraph* or *post* on some future specified day.

CHECKING of FORECASTS.

In order to test the accuracy of the forecasts they are compared carefully with the weather reported in the various districts on the days to which they referred, and the results of the checking for 8.30 p.m. are given in this Report (page 10).

In carrying out this comparison the portions of the forecasts which referred to wind have been carefully separated from those relating to weather. The detailed results of the comparison will be found in Appendix X., page 94.

CHECKING of STORM WARNINGS.

The testing of the warnings is still conducted in the manner indicated in earlier reports.

In order to render the information in the possession of the Office as to the weather experienced on our coasts still more complete, the Council have, as in preceding years, made application to the various Lighthouse Boards, and have obtained from them the original log-books from some of the most exposed lightships and lighthouses. They would here express their cordial thanks for the co-operation so readily granted to them by these Boards.

The result of the checking for 1889 will be found on page 13.

In the course of the ensuing year improvements are to be made both in the issue and checking of these storm warnings.

APPENDIX IX.

CORRESPONDENCE with CHIEF SIGNAL OFFICE, WASHINGTON, as to FORECASTS.

(M.O. 825.)

Signal Office,
War Department, Washington City,
April 26, 1889.

DEAR SIR,

I SHALL be very much gratified if you will kindly furnish me with certain information concerning the methods, form, and extent of weather forecasts made by the weather service under your direction. Information upon the following points is especially desired:—

First. At what hour of the day are the observations made on which weather forecasts are based.

Second. At what hour of the day are the predictions themselv issued.

Third. Are these forecasts distributed generally by telegraph, or by what means and to what extent do they reach the general public.

Fourth. Are the weather forecasts generally displayed throughout your country, or is their use limited largely to the central station.

Fifth. How long a period in advance is covered by these forecasts, and does such period count from the hour of observation or from the hour of making the forecast.

Sixth. Are daily weather maps or bulletins issued for current use, and, if so, how long after the hour of observation is it before they reach the general public.

I should be very much gratified also if you would give the benefit of your advice, based on your experience in forecasts, as to whether you believe that forecasts general in their nature best meet meteorological needs, or whether they should be sharply defined as to time, locality, and phenomena.

I should be also pleased to know whether you find it to be true or not that the greater part of the rain which falls comes rather in patches and as local showers than as general rains which cover the entire country.

Appreciating the courtesy you extend to me by giving me information on these points, and asking the great favour of an early reply,

I am, &c.

(Signed) A. W. GREELY,
Brigadier General and
Chief Signal Officer.

Mr. R. H. Scott,
Secretary of the Meteorological Committee,
116, Victoria Street, London, S.W., England.

(P.C. 1113.) Meteorological Office,
June 1, 1889.

DEAR SIR,

IN reply to your letter of April 26, I am instructed by the Council to supply you with the following answers to the queries contained therein.

First.—The observations are made at 8h. a.m., 2h. p.m., and 6h. p.m.

NOTE.—The Postal Telegraphic offices are, generally speaking, not opened before 8h. a.m., and are closed at 8h. p.m.

Second.—Forecasts are prepared three times daily on week days, viz., at 11h. a.m., 3h. 30m. p.m., and 8h. 30m. p.m. Only those prepared at 11h. a.m. and 8h. 30m. p.m. are issued to the public, except in the summer during the harvest. (*See* answer to questions 3 and 4.)

On Sundays the only forecasts drawn out are those at 8h. 30m. p.m. for publication on Monday mornings, the Sunday morning observations are used as data for the issue of storm warnings only. The afternoon service is suspended on Sundays.

Third and *Fourth.*—The 8.30 p.m. forecasts are supplied at the office gratuitously to the newspapers, either directly or through the press agencies, and appear in the leading newspapers all over the kingdom on the following morning. They are not issued otherwise by the office.

The 11h. a.m. forecasts are printed at the office on separate fly-sheets, and supplied to subscribers, almost exclusively resident in London, at a yearly charge of 10*s.* They are also distributed gratuitously for exhibition to the public at various places in London,

including the Meteorological Office, the Mansion House, and many of the shops of leading opticians. These forecasts are also reproduced in the lithographed Daily Weather Report, and appear in some of the evening newspapers in London, to which they are supplied gratuitously.

The 3h. 30m. p.m. forecasts are exhibited at the Meteorological Office, and during the Hay Harvest operations are sent by telegraph at the expense of the Office to about 30 selected stations where they are exhibited to the public.

A few persons are also supplied with these forecasts during the harvest on the payment of a nominal fee and the cost of telegraphy.

Fifth.—The forecasts cover a period of about 24 hours. Those prepared at 11h. a.m. cover the period till noon next day. Those prepared at 3h. 30m. and 8h. 30m. p.m. refer to the next civil day.

Sixth.—The lithographed Daily Weather Report is issued to the extent of over 480 copies, of these 60 are supplied gratuitously for exhibition at seaports. About 150 are forwarded also gratuitously to scientific institutions, &c. at home and abroad, and nearly 200 are supplied to private subscribers.

The forecasts are sub-divided as to the 11 districts into which the United Kingdom has been divided, on agricultural considerations. These are shown in the key map published with the Weekly Weather Report.

In the opinion of the Council it is not possible to define forecasts sharply either as to time, locality, or phenomena.

No discussion of the rainfall has as yet been carried out with a view to showing the extent to which it is general in its distribution or partial. This would probably be found to be in some measure dependent on the season of the year, as well as on the particular atmospheric conditions under which the rain fell.

In all cases the existence of a line of hills transverse to the direction of the wind, renders the fall locally more or less partial.

I am, &c.

(Signed) ROBERT H. SCOTT,
Secretary.

P.S.—I enclose copies of Circulars 27 and 27*a*, which explain the supply of weather information to the public and the press.

APPENDIX X.

REPORT ON THE COMPARISON OF THE FORECASTS ISSUED AT 8h. 30m. p.m. WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1889 to March 1890. The results are for the United Kingdom as a whole.

The letters used have the following signification :—

a = complete success.	**c** = partial failure.
b = partial (more than half) success.	**d** = total failure.

The checking has been conducted on the same system as that employed in previous years, *i.e.*, each forecast has been considered under the separate headings of "Wind" and "Weather," but the results of the 8.30 p.m. Forecasts only are here published.

The first column gives the percentage of success in "Wind," the second in "Weather," and the third the average of the two.

The Summary for the whole year is given at page 10.

Months.		Per-centages. Wind.	Weather.	Average.	a + b.	Months.		Per-centages. Wind.	Weather.	Average.	a + b.
April	a	46	50	48		October	a	36	54	45	
	b	36	28	32	80		b	40	26	33	78
	c	13	11	12			c	16	13	15	
	d	5	11	8			d	8	7	7	
May	a	59	50	55		November	a	55	39	47	
	b	27	30	28	83		b	28	45	37	84
	c	10	12	11			c	11	7	9	
	d	4	8	6			d	6	9	7	
June	a	59	57	58		December	a	41	41	41	
	b	31	23	27	85		b	30	33	32	73
	c	9	10	10			c	17	14	15	
	d	1	10	5			d	12	12	12	
July	a	55	51	53		January	a	41	48	45	
	b	29	27	28	81		b	32	34	33	78
	c	12	16	14			c	20	10	15	
	d	4	6	5			d	7	8	7	
August	a	49	52	51		February	a	60	53	57	
	b	34	35	34	85		b	24	30	27	84
	c	9	8	9			c	10	8	9	
	d	8	5	6			d	6	9	7	
September	a	52	51	52		March	a	33	46	40	
	b	30	31	30	82		b	36	35	35	75
	c	11	9	10			c	23	8	16	
	d	7	9	8			d	8	11	9	

APPENDIX XI.

Telegraphic Weather Intelligence.

The following stations are supplied with telegraphic information of storms, free of expense, and signal "cones" have been furnished to most of them, all further expenses attendant on the maintenance and repair of the apparatus being borne locally. The stations are situated, 88 in England and Wales, 44 in Scotland, 15 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.E.	IRELAND, S.W.	ENGLAND, S.W.	ENGLAND, E.
Lerwick.	New Ross.	Scilly.	Harwich.
Scalloway.	Dunmore East.	St. Just.	Ipswich.
Dunrossness.	Dungarvan.	St. Sennen.	Southwold.
Stromness.	Youghal.	Penzance.	Yarmouth.
Kirkwall.	Queenstown.	Falmouth.	Cromer.
Holborn Head.	Passage.	Pendennis.	Sheringham.
Wick.	Cork.	Mevagissey.	Lynn.
Avoch.	Kinsale.	Plymouth.	Sutton Bridge.
Inverness.	Tralee.	Devonport.	
Nairn.	Limerick.	Teignmouth.	
Burghead.	Galway.	Exmouth.	
Lossiemouth.			
Buckie.	IRISH SEA.		
Port Knockie.	Belfast.		
Cullen.	Donaghadee.		
Portsoy.	Howth.		
Banff.	Kingstown.		
Fraserburgh.	Ramsey (I. of M.).	ENGLAND, S.	
Peterhead.	Douglas ,,	Guernsey.	
Aberdeen.	Castletown ,,	St. Heliers (Jersey).	ENGLAND, N.E.
	Silloth.	Gorey (Jersey).	Boston.
	Maryport.	Weymouth.	Cleethorpe.
	Workington.	Poole.	Grimsby.
	Whitehaven.	Cowes.	Goole.
	Barrow.	Ryde.	Hull.
SCOTLAND, E.	Morecambe.	Portsmouth.	Bridlington Quay
Stonehaven.	Fleetwood.	Littlehampton.	Filey.
Montrose.	Blackpool.	Brighton.	Whitby.
Broughty Ferry.	Lytham.	Newhaven.	Redcar.
Dundee.	Southport.		Middlesborough.
St. Andrews.	Liverpool.		Sunderland.
Anstruther.	Runcorn.		South Shields.
Pittenweem.	Connah's Quay.		Tynemouth.
Burntisland.	Penmaenmawr.		Berwick - on - Tweed.
Grangemouth.	Port Penrhyn.		
Bo'ness.	Port Dinorwic.		
Granton.	Carnarvon.	ENGLAND, S.E.	
Newhaven.	Holyhead.	Hastings.	
Leith.		Rye.	
Fisherrow.	ST. GEORGE'S CHANNEL.	Sandgate.	
Dunbar.	Aberystwith.	Folkestone.	
Cockburnspath.	Milford.	Dover.	
Eyemouth.		Margate.	
	BRISTOL CHANNEL.	Faversham.	
	Pembrey.	Sheerness.	
	Llanelly.	Chatham.	
	Swansea.		
SCOTLAND, N.W.	Briton Ferry.		
Port of Ness (Island of Lewis).	Porthcawl.		
	Penarth.		
	Cardiff.		
	Newport.		
	Weston-super-Mare.		
	Burnham.		
	Ilfracombe.		
SCOTLAND, W.	Barnstaple.		
Glasgow.	Appledore.		
Greenock.	Boscastle.		
Rothesay.	Port Isaac.		
Campbelton.	Newquay.		
Girvan.	Hayle.		
Ballantrae.	St. Ives.		

APPENDIX XII.

CORRESPONDENCE with the BOARD OF TRADE as to the WASHINGTON MARITIME CONFERENCE.

(M.O. 1977.) Board of Trade, (Marine Department),
London, S.W.
November 11, 1889.

SIGNALS.

SIR,

I AM directed by the Board of Trade to request that you will be good enough to lay the following circumstances before the Council of the Meteorological Office for their consideration.

A Maritime Conference (to which Her Majesty's Government have sent delegates) is now sitting at Washington. It was at first arranged that the British Delegates should not proceed beyond a discussion of (1) the Regulations for preventing Collisions at Sea; and (2) the draft to which vessels should be loaded.

Her Majesty's Government have, however, now decided to join in the discussion of other matters, among which the following are included:—

(*a.*) The transmission of warnings;

(*b.*) The uniformity of signals employed.

Under these circumstances, Lord Salisbury and Sir Michael Hicks-Beach are desirous of sending to Washington at once an additional delegate competent to take part in the discussion on these points; and I am to request that you will ask the Council of the Meteorological Office to favour the Board of Trade with their observations in the matter, and to suggest the name of a gentleman they think suitable for the duty in question.

I am, &c.

The Secretary, (Signed) HENRY G. CALCRAFT.
Meteorological Office,
116, Victoria Street, S.W.

(P.C. 2148.) Meteorological Office,
November 13, 1889.

SIR,

I HAVE to acknowledge the receipt of your letter of the 11th instant, addressed to the Secretary of the Meteorological Council, relative to a proposal to send to the Maritime Conference now sitting at Washington a delegate qualified to take part in a discussion on storm warnings, which subject is among those to be brought before the conference.

Understanding it to be important that no time should be lost in dealing with this matter, I think it better to inform you at once of the conclusions I have come to, after discussion with the Secretary to the Council, rather than wait to bring it before the full Council, which would necessarily involve a delay of some days. I feel satisfied, however, that the opinions I shall express would be confirmed by the Council.

I cannot think that any practical advantage would be derived from sending a delegate to Washington for the purpose in question. The subject of storm warnings and of forecasting weather, on which the issue of such warnings depends, has been constantly before the Meteorological Office from its first formation, and the Council has been in frequent and intimate communication with the Meteorological Office at Washington as well as with the corresponding departments of the chief States of Europe on the subject, and it regularly interchanges telegraphic infor-

mation with these last for the purpose of weather forecasting. For more than two years the Council received from Washington daily telegrams designed to convey from the other side of the Atlantic information obtained there, and considered to be likely to be useful in the forecasting of weather in the British Isles. A very prolonged and patient discussion of the data thus procured has satisfied the Council, and I may add all the staff employed in the preparation of forecasts, which is composed of very intelligent persons, having very prolonged experience in this branch of duty, that no advantage whatever could at present be derived from communications received from the coasts of America. The Council have therefore for nearly a year ceased to participate in this special telegraphic service, and there seems to be no prospect of the character of the available information being so modified as to justify its renewal.

Doubtless great advantage may be obtained by improving and extending the transmission of information along the coasts of the continent of America from and to suitable stations, and there is every reason to think that the Meteorological Offices of the United States and the Dominion of Canada fully appreciate this, and act in concert in giving effect to it.

But the preparation of weather forecasts, and the issue of warnings as to expected storms, must in the very nature of the subject be dealt with locally, and it is very questionable whether any useful purpose would be gained by the adoption of uniformity of methods, otherwise than so far as the general progress of scientific knowledge indicates the direction of possible improvement, and this it is hardly necessary to say is more likely to be secured by looking favourably on independent working rather than the reverse.

Even in such a matter as that of weather signals, it also seems doubtful whether the attempt to introduce uniformity would be successful or useful. Such signals are virtually made for the use of the shipping or fishing vessels in the harbours or proposing to leave them, and so long as their significance is clearly understood by the local population, they may be held to have performed the functions expected of them.

Finally. I may observe that there is no one whom the Council is likely to name, should the deputation of a delegate be resolved on, except their Secretary, Mr. R. H. Scott, who no doubt possesses all the necessary qualifications. But such a mission would be entirely outside the duties of his office, and he could hardly be expected to undertake it without special remuneration.

I am, &c.
(Signed) R. STRACHEY,
Chairman of the Meteorological Council.

The Assistant Secretary,
Marine Department, Board of Trade.

APPENDIX XIII.

CORRESPONDENCE with the BOARD OF TRADE as to a METEOROLOGICAL STATION at BERMUDA.

METEOROLOGY.

(M.O. 1222.) Board of Trade (Marine Department,)
SIR, London, S.W., July 9, 1889.

I AM directed by the Board of Trade to transmit to you, to be laid before the Council of the Meteorological Office, a letter with inclosures, which they have received from the Colonial Office on the subject of a proposal which has been made to establish a meteorological station at Bermuda, and I am to state that, before replying to Lord Knutsford, the Board would be glad to be favoured with the views of your Council on the subject, both as regards the expediency of establishing such a station and the probable cost of so doing.

I am to request that the inclosures may be returned with your reply.

I am, &c.
(Signed) THOMAS GRAY.

The Secretary,
Meteorological Office,
116, Victoria Street, Westminster, S.W.

SIR, Downing Street, July 3, 1889.

I AM directed by Lord Knutsford to transmit to you, to be laid before the Board of Trade, a copy of a despatch from the Governor-General of Canada, and of a letter from the High Commissioner for Canada in London, recommending the establishment of a meteorological station at Bermuda.

Lord Knutsford would be glad to learn the views of the Board of Trade on this proposal, and also to be furnished with any information which may be in the possession of the Board of Trade as to the probable cost of establishing and maintaining such an observatory.

I am, &c.
(Signed) R. H. MEADE.

The Secretary to the
Board of Trade.

Sir C. TUPPER to the COLONIAL OFFICE.

9, Victoria Chambers, Westminster, S.W.,
SIR, June 24, 1889.

I HAVE the honour to transmit to you herewith, a copy of an order of the Privy Council of Canada, dated the 27th May 1889, with reference to the proposed telegraphic communication between Bermuda and Halifax.

I venture to think that the proposal made by the Minister of Marine and Fisheries that a meteorological station should be established at Bermuda, and that observations should be telegraphed regularly therefrom to the head office in Toronto, worthy of the consideration of Her Majesty's Government. I beg, therefore, that you will be so good as to move Lord Knutsford to bring the matter to the notice of the proper authorities, and trust that the suggestion will have the benefit of his Lordship's powerful support.

I am, &c.
(Signed) CHARLES TUPPER.

The Under Secretary of State,
Colonial Office.

LORD STANLEY OF PRESTON to LORD KNUTSFORD.

Canada, New Richmond P.Q.,
June 4, 1889.

MY LORD,

THE Director of the Meteorological Service at Toronto having drawn the attention of the Dominion Government to the fact that the Bermuda Islands will shortly be in telegraphic communication with Halifax, and that great benefit would accrue to the service by the establishment of a meteorological station at Bermuda, I have the honour to transmit to your Lordship a copy of an approved minute of the Privy Council, embodying a report of my Minister of Marine and Fisheries upon the subject.

I have, &c.
(Signed) STANLEY OF PRESTON.

The Right Hon. Lord Knutsford,
&c. &c. &c.

CERTIFIED COPY of a REPORT of a COMMITTEE of the Honourable the PRIVY COUNCIL, approved by his Excellency the GOVERNOR GENERAL in Council on the 27th May 1889.

ON a report dated 20th May 1889 from the Minister of Marine and Fisheries stating that the Director of the Meteorological Service at Toronto has drawn attention to the fact that the Bermuda Islands will shortly be in telegraphic communication with Halifax, and that great benefit would accrue to the service by having a meteorological station at Bermuda, and observations telegraphed therefrom twice a day to the head office in Toronto.

The Minister states that it appears that there is a class of storms which frequently do a large amount of damage in the Maritime Provinces and the Gulf of St. Lawrence, the occurrence of which the Meteorological Service are unable at present to foresee for any considerable time before they strike the shores of Canada, and the Director is of opinion that if he had regular returns from Bermuda of observations, taken at the same time as those on the Continent, he would probably be able, as a rule, to locate the position of these storms with sufficient accuracy to give at least 24 hours warning of their approach to the coast, a warning which would be the means of saving much loss of life and destruction of property.

The Minister is of opinion that the establishment of a station at Bermuda would be of benefit not only to Canada, but that it would also be attended with much advantage to Her Majesty's ships of war stationed at Halifax, and he recommends that the matter be brought under the consideration of Her Majesty's Government, and inquiry be made as to whether they would not assume the cost of establishing a station at Bermuda and transmitting the telegraph messages required to the head office of the Dominion Meteorological Service at Toronto, it being understood that the cost of issuing the necessary warning to shipping on the receipt of such messages is to be defrayed by the Government of Canada.

The Committee concurring in the above recommendation of the Minister of Marine and Fisheries advise that your Excellency be moved to forward a copy of this minute to the Right Honourable the Secretary of State for the Colonies.

All which is respectfully submitted for your Excellency's approval.

(Signed) JOHN MCGEE, Clerk,
Privy Council.

(P.C. 1482.)

SIR, Meteorological Office, July 31, 1889.

YOUR letter of the 9th instant relative to the proposed establishment of a meteorological station at Bermuda having been considered by the Meteorological Council, I am directed to convey to you the following expression of the opinions they have formed on the questions submitted to them.

The Council can have no doubt that advantage should be taken of the establishment of telegraphic communication with Bermuda to obtain regular meteorological reports from that island, to be utilised in improving the forecasts of weather to be expected on the coasts of the North Atlantic. They consequently do not hesitate to support the proposal of the Government of the Dominion of Canada to form a meteorological station at Bermuda, from which regular reports should be transmitted to Halifax and Toronto.

The Council are not in possession of precise information as to the system of forecasting adopted by the Central Canadian Meteorological Office at Toronto, but it is presumed that information is obtained from the United States Bureau at Washington as to the advance of any atmospheric disturbances from the south, likely to have influence on the weather in Canada. It is necessary to remark that, for any reliable forecast of changes of weather likely to result in Canada from disturbances in the neighbourhood of Bermuda, it would be necessary to consider the effect of changes that might occur in the intervening region, and the atmospheric conditions along the coasts of the United States. These are systematically taken cognizance of at the Office at Washington, which would unquestionably desire to be furnished with any meteorological reports sent from Bermuda. The well-known liberality of the Washington Office leads the Council to expect that information of the nature now in question, which that Office might obtain, would be readily communicated to Toronto, and, combined with this, the reports from Bermuda might reasonably be expected to supply very valuable data for forecasting the weather on the coasts of Canada, the importance of accuracy in which to the ships of Her Majesty's Navy, as well as the Mercantile Marine, is indisputable.

With reference to the cost of establishing and maintaining such a meteorological station, I am to state the usual equipment of instruments for a telegraphic reporting station is about 12*l.* No special building is needed, and suitable places for the instruments could, no doubt, readily be found in or near the telegraph office. Further, as the requisite observations would only occupy a few minutes two or three times a day, it would probably be possible to secure the services of one or other of the telegraph signallers by a small payment, such as is usual at similar stations in this country, which would not exceed 15*l.* to 20*l.* yearly.

I am, &c.

(Signed) ROBERT H. SCOTT,
Secretary.

The Assistant Secretary,
Marine Department, Board of Trade.

APPENDIX XIV.

Fishery Barometers.

List of Places supplied with Fishery Barometers.

Shetland Isles.—*Balta Sound, *Uya Sound, *Nesting, *Lerwick, *Sandsair, *Scalloway, *Symbister.

Orkney Isles.—Westray, *Burra, *Kirkwall.

Scotland, east coast.—Freswick, Auchengill, *Keiss, *Staxigoe, *Wick, *Sarclet, *Lybster, *Dunbeath, *Portmahomack, *Cromarty, *Avoch, *Nairn, *Burghead, *Portessie, *Port Knockie, *Portsoy, *Whitehills, *Gardenstown, *Rosehearty, *Pitullie, *Inverallochy, *Pointlaw, *Findon, *Portlethen, *Skateraw, *Stonehaven, *Arbroath, *Broughty Ferry, *St. Andrews, *Crail, *Cellardyke, *St. Monance, *Burntisland, *Newhaven.

England, east coast.—*Berwick, *North Shields, *South Shields, *Sunderland, *West Hartlepool, *Staithes, *Scarborough, *Filey, *Flamborough, *Bridlington Quay, Withernsea, Hull, *Lynn (2), *Wells, *Gorleston, *Harwich, *Brightlingsea, *Margate, *Deal, *Kingsdown, *Dover.

England, south coast.—Bognor, Ryde, East Cowes, Bembridge, Brixton, Atherfield, Ventnor (2), *Gorey (Jersey), Haslar Hospital, Poole, Weymouth, Portland, Budleigh Salterton, Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscath, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn, Mousehole.

England, south-west coast.—St. Ives, Hayle, Padstow, Port Isaac, Boscastle, Highbridge, Weston-super-Mare.

Wales.—Briton Ferry, Swansea,* Angle, *Milford, Nevin, Carnarvon.

England, north-west coast.—*Fleetwood, *Morecambe, *Maryport.

Isle of Man.—*Douglas, *Port St. Mary, *Peel.

Scotland, south-west coast.—*Port Patrick, *Stranraer.

Ireland, east coast.—*Cushendall, *Belfast, *Bangor (Co. Down), *Groomsport, *Donaghadee, *Ardglass, *Carlingford, *Greenore, *Dundalk, *Malahide, *Howth, *Kingstown (2), *Bray, *Wicklow.

Ireland, south coast.—Dunmore East, Dungarvan, Crosshaven, Kinsale, Union Hall, Castletownsend, Baltimore, Schull, Crookhaven.

Ireland, west coast.—*Valencia, Dingle, Tralee, Tarbert, Kilcredane, Kilronan, Spiddal, *Elly Bay, *Ballyglass, *Ballycastle (Co. Mayo), *Donegal,*Tribane, *Killybegs, *Teelin, *Portnoo, *Burton Port, *Kincaslagh, *Bunbeg.

Ireland, north coast.—*Dunfanaghy, *Rathmullen, *Buncrana, *Moville, Greencastle, *Portrush, *Portstewart.

Scotland, west coast.—*Tarbert (Loch Fyne), *Campbeltown, *Carradale, *Portree (Isle of Skye), *Plockton, East Mey, *Stroma.

Hebrides.—*Stornoway, Portnaguiran, *Obb, Valtos, Carloway, *Ness.

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* Inspected.

SUMMARY of STATIONS supplied with INSTRUMENTS.

England and Wales - - - - -	66
Scotland and Isle of Man - - - -	62
Ireland - - - - - -	49
	177

APPENDIX XV.

LIST of STATIONS from which CONTINUOUS RECORDS of BRIGHT SUNSHINE have been received.

Station.	Observer.
Aberdeen Observatory - -	Prof. C. Niven, M.A., F.R.S.
Armagh Observatory - - -	J. L. E. Dreyer, Ph.D., F.R.A.S.
Blackpool - - - -	J. Wolstenholme.
Cambridge - - - -	H. Todd.
Churchstoke - - - -	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester - - - -	Prof. Ohm, B.A., F.R. Met. Soc.
Cronkbourne, Isle of Man - -	A. W. Moore, M.A., J.P.
Cullompton - - - -	Thos. Turner, J.P., F.R. Met. Soc.
Dublin - - - - -	Major Kirkwood, R.E.
Durham - - - - -	H. J. Carpenter.
Eastbourne - - - -	R. Sheward, F.R. Met. Soc.
Falmouth Observatory - - -	E. Kitto, F.R. Met. Soc.; for the R. Cornwall Polytechnic Soc.
Geldeston, Beccles - - -	E. T. Dowson, F.R. Met. Soc.
Glasgow - - - -	Prof. R. Grant, M.A., LL.D., F.R.S.
Hastings - - - -	H. Colborne, M.R.C.S.
Hillington - - - -	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Jersey (St. Helier's) - - -	Capt. Bichard, Harbour Master.
Kew Observatory - - -	G. M. Whipple, B.Sc., F.R.A.S.; for the Kew Committee.
Leicester (Thurcaston) - - -	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Llandudno - - - -	J. Nicol, M.D., J.P., F.R. Met. Soc.
London, Bunhill Row - - -	Messrs. de la Rue.
„ Westminster - - -	The Staff, Meteorological Office.
Marchmont - - - -	P. Loney.
Markree Castle - - - -	A. Marth, F.R.A.S.; for Col. E. H. Cooper, F.R.A.S.
Newton Reigny (Penrith) - -	T. G. Benn, F.R. Met. Soc.
Oswald Kirk, Yorkshire - - -	R. Thompson.
Oxford - - - - -	E. J. Stone, F.R.S.
Parsonstown - - - -	O. Boeddicker, Ph.D.; for the Earl of Rosse, K.P., F.R.S.
Plymouth - - - -	J. Merrifield, LL.D., F.R.A.S.
St. Ann's Head - - - -	S. Blake.
Southampton - - - -	Sir C. Wilson, Col. R.E., K.C.B., F.R.S.
Stonyhurst - - - -	Rev. W. Sidgreaves.
Stornoway - - - -	John Forbes.
Sutton Coldfield - - - -	C. F. Marston, C.E.
Swanbister (Orkney) - - -	W. Irvine Fortescue.

Station.	Observer.
Valencia Island	J. E. Cullum, F. R. Met. Soc.
Westgate-on-Sea	J. Norman Lockyer, F.R.S.
Worksop	H. Mellish, F.R.Met. Soc.
York	J. E. Clarke, B.A., B.Sc.
Georgetown, Demerara	G. S. Jenman.

In addition, the number of hours sunshine recorded each day is reported from the following Stations :—

Glencarron	D. D. Munro.
Fort Augustus	Rev. E. G. Cody, O.S.B.
Braemar	J. A. Aitken, J.P.
Stowell	Rev. H. J. Poole, F.R. Met. Soc.

APPENDIX XVI.

METHODS FOLLOWED IN DEALING WITH METEOROLOGICAL RETURNS FROM LAND STATIONS IN THE BRITISH ISLES.

These stations are of five classes, as stated on page 16.

I.—*Observatories continuously observing all the Meteorological Elements.*

Returns from observatories.

Hourly measurements of the curves obtained from the self-recording instruments at the observatories of the Office are made by the observers at each station, on printed forms supplied for the purpose, which, together with the curves, are forwarded to the Office weekly. They comprise measurements of the barograms, of the dry-bulb and wet-bulb thermograms, of the anemograms, and of the rain-gauge curves.

Examination of returns.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the regulations which have been adopted to secure this end are in the main the same as those which will be found in the Report of the Office for 1868. They comprise rules for the guidance of observers, as well as of the assistants charged with the examination of the work at the Office. Attention need be called here to only two of these rules, viz., (*a*) the use of subsidiary sheets on which are entered the results of a second set of measurements of the curves made after, and quite independently of, the first set, and with a different scale, the two sets of measurements being afterwards compared together, and any differences found inquired into and set right; and (*b*) the re-measurements of the curve made by the assistants at the Meteorological Office, and which always amounts to 40, and in doubtful cases to many more, per month, for each element. The attention of the observers is always drawn to such errors as may be detected, and to any failures in the continuity of the curves arising from failure of the light, stoppage of the clock, defective photography, faulty action of the wet-bulb thermometer, &c.; a report containing the results of the examination of each Observatory being also submitted to the Council periodically. The curves and tabulations are eventually bound and stored in the Office.

Results of examination and report to Council.

In connexion with this work should be mentioned the general watch which has to be kept over the working of the observatories and of the instruments, not only to secure uniformity amongst them and observance of rules, but also to guard against small changes which are liable to occur at certain times, especially with the thermographs, and which may affect the scale-values of the instrument or the datum lines used for the tabulation of the curves. About twice a year this work calls for special examination, entailing some considerable time and occasionally the engraving of new scales for measuring the curves. General supervision of observatory work.

The photographic curves are also used in the harmonic analyser; and for this purpose the barograms require a slight special preparation. Harmonic analyser.

Method of dealing with the Numerical Results from the Self-recording Observatories.

In dealing with the tabulations the first step is to go over the sheets and fill up by interpolation, wherever possible, any gaps or breaks in the continuity of the record. Interpolations.

The record having been made as complete as possible, the daily, five-daily, and monthly means of the barometer and of the dry-bulb and wet-bulb thermometers are deduced. Means.

The hourly vapour tension is then computed by an expansion of Glaisher's Hygrometrical Tables, prepared in the Office, and the work is independently checked. Vapour tension.

A copy is next prepared of the above-mentioned hourly measurements of the barometer, dry-bulb and wet-bulb thermometers, wind and rain curves, and of the computed values of vapour tension. To these are added the daily means of the three first-mentioned elements, the extremes and daily range of pressure and temperature, and the daily totals of rainfall, and the whole series is printed and published under the title of "Hourly readings from the self-recording Instruments at the Four "Observatories under the Meteorological Council." Hourly Readings.

To ensure accuracy the sheets are read over in proof with the original measurements of the curves. The interpolated readings are printed in *italic* type, but no distinguishing mark is affixed to means which are partly based on them. When the gap in the record is too long to be dealt with by an interpolation of the missing hourly readings, the mean for the day is obtained either from the maximum and minimum readings for the day, or by an interpolation from the adjacent daily means, and the result thus obtained is printed as an approximation.

The five-daily, monthly, and annual means, together with the absolute extremes of pressure and temperature for each month, are printed as part of the "Hourly Readings." The tables are repeated in French measures. Annual Tables.

The gale tables printed in the text of the Quarterly Weather Report, which show the extent, duration, and degree of severity of all the stronger gales, are prepared from the tabulations of the anemograms received from the self-recording observatories, together with those received from the extra anemographic stations. Tables for the Quarterly Weather Reports. Gale tables.

II.—*Anemographic Stations at which the Wind is recorded continuously.*

The anemograms received from the stations enumerated on pages 108 *et seq.* are regularly examined and tabulated in the Office, and the sheets bound up in volumes. Besides special inquiries on legal and other points

that from time to time arise, and in which these documents are of high importance, the tabulations are always employed in the preparation of the summary of weather and gale tables for the Quarterly Weather Report. They are also regularly used in the checking of the Storm Warnings issued by the Office.

III.—*Land Stations of the Second Order.*

Origin and progress of system.

Ever since the year 1866 returns of more or less completeness have been received from land stations in the United Kingdom. In that year there was only one station, but by 1871 the number had increased to 15, and five years later to 49, including 14 stations belonging to the Royal Meteorological Society, copies of the returns from which were sent to the Office under a special arrangement with the Society.

At the end of the present year the total number of stations was 97, including 17 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society.

This is an increase of 20 stations as compared with the previous year, which is mainly due to the fresh arrangement mentioned on page 19.

It must, however, be observed that while this number is exclusive of the self-recording observatories and of the anemographic stations, it includes several others from which only very scanty information is received.

The stations are distributed as follows: 43 in England, 4 in Wales, 26 in Scotland, and 24 in Ireland.

The methods followed with regard to the examination and publishing of these returns have been fully detailed in previous reports, and need not now be repeated. The only changes introduced into the volume at present in hand, namely, that for 1886, refer to the barometer readings, which are for the first time given at station-level instead of being reduced to the mean sea-level; and to the humidity, where the depression of the wet-bulb is now shown, the international forms A and B being modified accordingly.

This volume (1886) will contain returns from 66 stations, a larger number than has been included in any volume that has preceded it.

Arrangements have been made under which it is hoped that the arrears of this publication will be rapidly reduced.

Reports from 11 of the Irish stations are regularly supplied to the Registrar-General for Ireland for his Weekly and Quarterly Returns.

New stations.

When an application for the adoption of a new station is received, a schedule is forwarded to the observer containing a series of questions as to the outfit of the station, the exposure of the instruments, and the influence likely to be exerted on their indications by surrounding objects, such as houses and trees. Only mercurial barometers are accepted, and only such as have been duly verified. All thermometers must have been tested at Kew. A plan of the station, showing the positions of the instruments with regard to neighbouring objects, is also required.

On the return of this schedule the answers are considered, and, where necessary, alterations are advised.

If, however, the existing arrangements are satisfactory, tables for reducing the barometer readings to 32° Fahrenheit at mean sea level are prepared and duplicates sent to the observer, together with a set of Hygrometrical Tables, and a copy of "Instructions in the Use of Meteorological Instruments."

The first returns are compared and examined with special care, and a report of the result of the examination is forwarded to the observer, with instructions how best to improve and complete the returns.

There are still many parts of the British Islands very poorly repreented by the existing stations, and any information for these districts would be valuable.

The daily records of sunshine which are now received from 39 Stations in the British Islands are examined generally to guard against accidental changes in the adjustment of the instruments. Notes explaining any omission or accidental defect are added to the cards if required, and after their receipt has been acknowledged, they are duly stamped and dated and then stored in the Office. Sunshine records.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VIII., and for those stations which are also Stations of the Second Order the monthly totals of bright sunshine in hours, together with the percentage of its possible duration, are published as Part IV. of "Returns from Stations of the Second Order." A table showing the daily amount of sunshine at Bunhill Row, one of the London stations, is also prepared quarterly for the Royal Meteorological Society. Weekly totals.

Inspection.

The Stations of the Second Order are regularly inspected, the attention of the inspector being directed by the Office to any special point which may require investigation.

IV.—*Telegraphic Reporting Stations.*

Full particulars relating to these stations, the information received from them, and the method of dealing with that information, will be found in Appendix VII. to the Report for the year 1888–9. A paragraph in that Appendix (p. 60) explains the use that is made of the monthly schedules sent in by the observers.

V.—*Extra Stations.*

No returns from Stations of the Fifth Class are published by the Office, but some of them are regularly used in the checking of the Storm Warnings, and all are available for any special investigation that may be taken up.

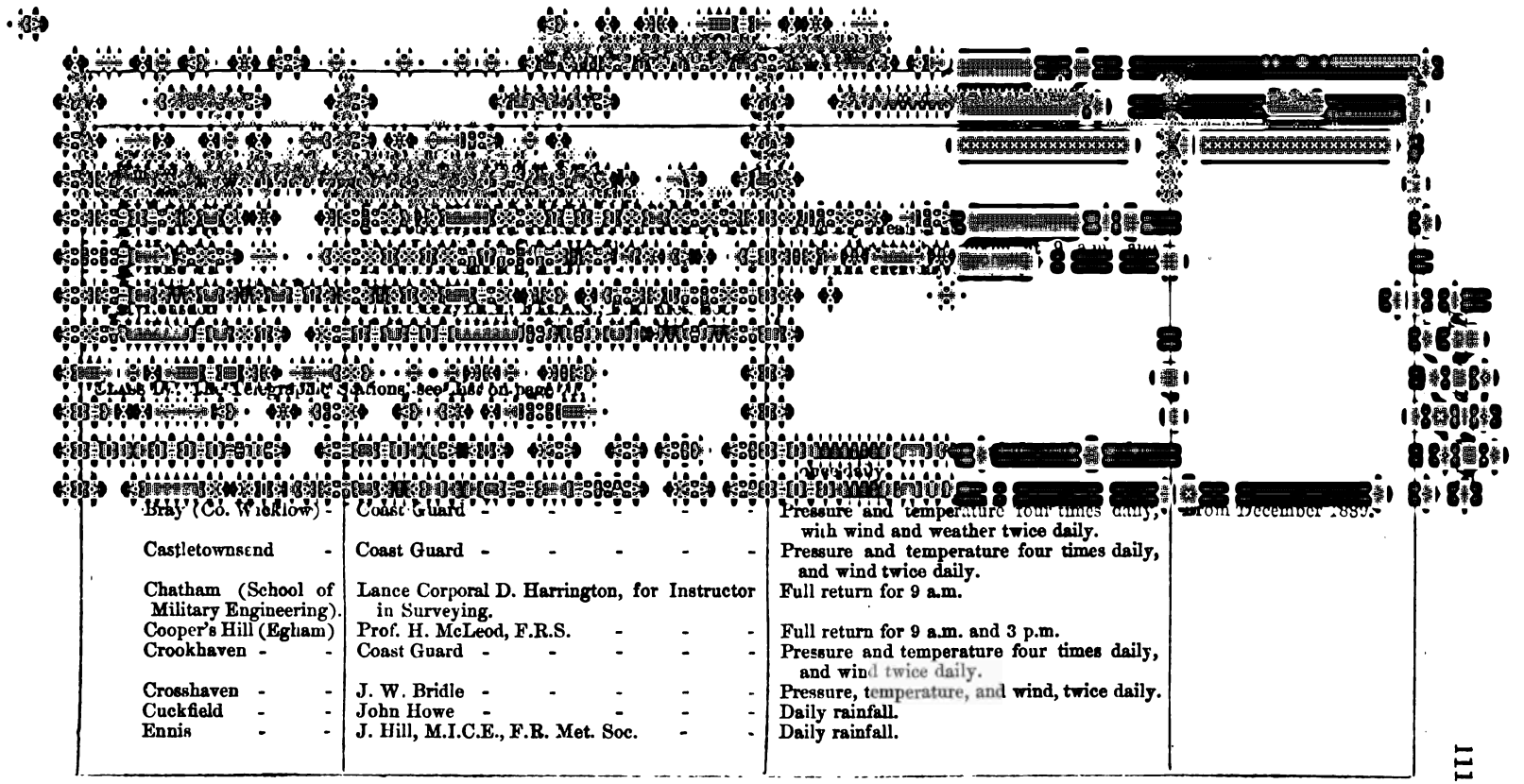
The rainfall values at these stations are, however, copied and supplied to Mr. Symons, F.R.S., for publication in "British Rainfall."

†North Shields -	Capt. W. Harrison - - - -	"	"
†Scilly - -	The late W. Thomas and A. Hicks - -	"	"
†Swanbister (Orkney)	W. Irvine Fortescue - - - -	"	"
†Yarmouth - -	G. T. Watson - - - - -	"	"
Heligoland - -	J. J. Friederichs - - - -	"	"
†Kilkenny Castle -	The Marquis of Ormonde, K.P. - -	Continuous record of pressure.	
London - -	The Athenæum Club - - - -	"	"
Nottingham - -	E. C. Patchett - - - - -	"	"
†Waterford - -	The Harbour Authorities - - -	"	"
CLASS III. †Armagh -	J. L. E. Dreyer, Ph.D., F.R.A.S. - -	Regular observations at 9 a.m. and 9 p.m. of pressure, temperature (dry-bulb and wet-bulb), wind, cloud and weather, with the daily maxima and minima of temperature, the daily rainfall, and general remarks on the weather.	
Aysgarth - -	Rev. Fenwick W. Stow, M.A., F.R. Met. Soc.		
†Braemar - -	James Aitken, J.P. - - - - -		
†Brookeborough -	W. Ferguson, for Sir Victor Brooke, Bt., F.L.S.		
†Carmarthen - -	G. J. Hearder, M.D. - - - - -		

†Markree Castle, Sligo	A. Marth, F.R.A.S., for Col. Cooper, F.R.A.S.
†Newton Reigny (Penrith).	T. G. Benn, F.R. Met. Soc. - - -
†Parsonstown - -	O. Boeddicker, Ph.D., for the Earl of Rosse, K.P., F.R.S.
†Prestwich (Manchester)	T. R. H. Clunn, M.D., F.R. Met. Soc. -
†St. David's, Pembroke	W. P. Propert, LL.D., F.G.S., F.R. Met. Soc.
Scarborough - -	Allan Rowntree - - - -
†Seaham - -	G. H. Aird - - - -
Southampton -	J. T. Cook, for Dir. Gen. of Ordnance Survey.
Stokesay - -	Miss M. A. Digges La Touche - -

☗†Cheltenham - -	R. Tyrer, B.A., F.R. Met. Soc. - -	
☗†Churchstoke - -	P. Wright, F.C.S., F.R. Met. Soc. - -	
☗ Cramlington - -	W. Bonallo, F.R. Met. Soc. - - -	Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m. each day as above.
☆†Fort Augustus -	Rev. E. G. Cody, O.S.B. - -	
☆†Fort William - -	C. Livingston, for Directors of Ben Nevis Observatory.	
☆†Glencarron - -	D. D. Munro, for the Lord McLaren - -	
☆†Glenlee (Kirkcudbrightshire).	W. Melville, for George Maxwell - -	
☆ Gordon Castle -	J. Webster, for the Duke of Richmond, K.G. -	
☗†Killarney - -	Archdeacon G. R. Wynne, M.A., F.R. Met. Soc.	
☆†Lairg - - -	William Ross, for Duke of Sutherland, K.G. -	
☆ Lednathie (Forfarshire).	W. Morrison, for Stormonth Darling, Q.C. -	

al Council.



Bray (Co. Wicklow) -	Coast Guard - - - - -	Pressure and temperature four times daily, with wind and weather twice daily.	from December 1889.
Castletownsend -	Coast Guard - - - - -	Pressure and temperature four times daily, and wind twice daily.	
Chatham (School of Military Engineering).	Lance Corporal D. Harrington, for Instructor in Surveying.	Full return for 9 a.m.	
Cooper's Hill (Egham)	Prof. H. McLeod, F.R.S. - - -	Full return for 9 a.m. and 3 p.m.	
Crookhaven - -	Coast Guard - - - - -	Pressure and temperature four times daily, and wind twice daily.	
Crosshaven - -	J. W. Bridle - - - - -	Pressure, temperature, and wind, twice daily.	
Cuckfield - -	John Howe - - - -	Daily rainfall.	
Ennis - -	J. Hill, M.I.C.E., F.R. Met. Soc. - -	Daily rainfall.	

LIST OF DOCUMENTS—*continued.*

Stations.	Observers.	Nature of Information received.	Notes.
Galway - -	Coast Guard - - - - -	Pressure and temperature four times daily, with wind.	
Gorleston - -	R. J. C. Day - - - - -	Pressure and wind twice daily.	
Harpenden - -	T. Wilson, F.R. Met. Soc. - - -	Pressure, temperature, and wind, twice daily, with rainfall.	
Haslar Hospital -	G. Coppen - - - - -	Pressure and temperature four times daily.	
†Killybegs - -	Coast Guard - - - - -	Pressure, temperature, wind, and weather once daily.	July to December 1889.
Knightstown (Valencia).	Coast Guard - - - - -	Pressure, wind, and weather once daily.	
North Arran - -	Coast Guard - - - - -	Pressure, temperature of air and sea four times daily, with wind and weather at noon.	
Rosehearty - -	" " - - - - -	Pressure once daily - - - -	May to December 1889.
†Rugby - -	W. N. Wilson, M.A., and H. P. Highton, B.A.	Full set of 9 a.m. observations with 9 p.m. temperatures.	
St. Leonards - -	H. Colborne, M.R.C.S. - - -	Full set of 9 a.m. observations.	
Schull - -	Coast Guard - - - - -	Pressure, temperature, and wind twice daily.	
Sheffield (Weston Park)	Elijah Howarth, F.R.A.S. - - -	Full return for 9 a.m. and 6 p.m.	
Stamford (Ketton Hall)	Fred. Coventry - - - -	Pressure, temperature (max., min., min. on grass), rainfall, and wind once daily.	
Stranraer -	P. Dorau - - - - -	Pressure, wind, and weather once daily.	
Sudbury - -	W. Bayley Ransom - - - -	Pressure, temperature (dry-bulb, max., min.), wind, cloud, and rainfall, once daily, with general remarks.	
Symbister, Shetland -	J. S. Nicolson - - - -	Pressure and temperature twice daily.	
Tarbert, Harris -	Donald Bethune - - - -	Pressure and wind twice daily.	
Totland Bay - -	John Dover, B.A., F.R. Met. Soc. - -	Full return for 9 a.m.	
Union Hall (Glandore)	Coast Guard - - - - -	Pressure, temperature, and wind, twice daily.	

NOTE.—The Stations marked "𝔐" belong to the Royal Meteorological Society; those marked "𝔖" belong to the Scottish Meteorological Society; those marked thus † have been inspected during the year.

APPENDIX XVIII.

Accessions to the Library during the Year ending 31st March 1890.

|| **Abercromby, Hon. R.**—On Meldrum's rules for handling ships in the hurricanes of the Southern Indian Ocean; with researches on the nature of hurricanes generally. la. 8°. (*Journ. Scott. Meteor. Soc., 3rd ser. No.* vi.)

* ——— Seas and skies in many latitudes or wanderings in search of weather. 8°. London, 1888.

|| **Aitken, J.**—On improvements in the apparatus for counting the dust particles in the atmosphere. Parts i. and ii. 8°. (*Proc. R. Soc. Edinb.*, xvi., 1889, *p.* 135.)

Algiers, Service Central Météorologique de l'Algérie.—Bulletin mensuel. 1888, Jan.—Dec. sm. f°. s.l.e.a.

[Algiers, Service Météorologique du Gouvernement Général de l'Algérie.]—Bulletin météorologique de l'Algérie. 1889, Jan. 1—Dec. 31. oblong sm. f°. Sheets.

(Allahabad, Meteorological Office.)—Administration report of the Meteorological Reporter to Government, North-Western Provinces and Oudh, for the year 1888–89. sm. f°. s.l.e.a.

[——— ———] Brief sketch of the meteorology of the North-Western Provinces, Oudh and Eastern Rajputana, for the year 1888. sm. f°. s.l.e.a.

* **Allan, W.**—Weather wisdom from January to December. Wherein will be found much that is curious, entertaining, and instructive. sm. 8°. London, [1889.]

Altitudes, Table of. sm. 8°. Sheet.

American Meteorological Journal.—A monthly review of meteorology, medical climatology, and geography. Edited by **M. W. Harrington** and **A. L. Rotch.** Vol. V., 1888–1889. la. 8°. Ann Arbor, s.a.

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.—Tijdschrift . . . onder redactie van **C. M. Kan** en **J. Æ. C. A. Timmerman.** Tweede serie. Deel vi. Meer uitgebreide artikelen. 8°. Leiden, 1889.

——— ——— Tijdschrift . . . onder redactie van **C. M. Kan** en **J. Æ. C. A. Timmerman.** Tweede serie. Deel vi. Verslagen en aardrijkskundige mededeelingen. 8°. Leiden, 1889.

|| **Angot, A.**—Étude sur la marche diurne du baromètre. la. 4°. (*Ann. Bureau centr. météor. France*, 1887, I., *p.* B. 237.)

Arata, P. N.—El clima y las condiciones higiénicas de la ciudad de Buenos Aires. la. 8°. Buenos Aires, 1889.

Augustin, F.—Untersuchungen über die Temperatur von Prag. la. 8°. [*Sitzungsb. k. böhm. Gesellsch. Wissensch. math.-naturw. Cl.*, 1889, *Bd.* ii., *p.* 357.]

Avignon, Commission Météorologique du Département de Vaucluse.—Compte-rendu pour l'année 1888. sm. f°. s.l.e.a.

Azambuja, G. A. de.—Annuario da Provincia de Rio Grande do Sul para os annos de 1889 e 1890. 2 vols. sm. 8°. Porto Alegre, 1888–89.

* || **Barber, S.**—The outline of cloud forms: the electric cumulus, anvil cloud, and rain-ball. 8°. (*Pop. Sc. Rev., ? year, p.* 359.)

Batavia, Magnetical and Meteorological Observatory.—Observations. . . . Published under the direction of Dr. **J. P. Van der Stok.** Vol. xi., 1888. f°. Batavia, 1889.

Note.—Books marked * have been acquired by purchase; the others are donations from institutions, societies, or authors. Those marked || are excerpt papers, extra copies of which have been separately printed.

In some cases additional publications have been received besides those specified, but only completed volumes or years are given here.

Batavia. Observatorium. — Regenwaarnemingen in Nederlandsch-Indië. Tiende Jaarg. 1888. Door **J. P. Van der Stok.** 8°. Batavia, 1889.

Title page and preface in the English language also.

|| **Bayard, F. C.**—Tables and diagrams illustrating the diurnal range of barometric pressure in the British Isles during the years 1876–1880. Calculated from the records of nine meteorological observatories in Great Britain and Ireland. la. 4°. (*Quart. Weather Rep.*, 1880, *Part* i., *App.* iii. *p.* [19].)

|| **Bebber, W. J. van.**—Abhängigkeit der Stärke des Unterwindes von der Unterlage. la. 8°. (*Ann. Hydr. mar. Meteor.*, 1889, *Dez.*)

* ——— Lehrbuch der Meteorologie für Studierende und zum Gebrauche in der Praxis. la. 8°. Stuttgart, 1890 [1889].

* || **Becquerel, [A. C.]**—Recherches sur les causes de l'électricité atmosphérique et terrestre et sur les effets chimiques produits en vertu d'actions lentes avec ou sans le concours des forces électriques. 4°. (*Mém. acad. sc., Paris*, xxvii., 2e *partie*, 1856, *p.* 153.)

* || ——— Recherches sur la température de l'air au Nord, au Midi loin et près des arbres. 4°. [*Mém. acad. sc., Paris*, xxxii., *p.* 393.]

* || ——— De la température moyenne d'un lieu, et des difficultés que présente sa détermination. 3e mémoire. 4°. [*Mém. acad. sc., Paris*, xxxii., *p.* 495.]

* || [———] De la température de l'air à 6 heures du matin et au lever du soleil. 4e mém. 4°. [*Mém. acad. sc., Paris*, xxxii., *p.* 537.]

* || ——— De la température de l'air dans les couches atmosphériques voisines du sol. 5e mém. 4°. [*Mém. acad. sc., Paris*, xxxii., *p.* 555.]

* || ——— De la température de l'air et de celle des couches superficielles de la terre. 6e mém. 4°. (*Mém. acad. sc., Paris*, xxxii., *p.* 599.)

* || ——— Sur la température de l'air et ses variations suivant l'état du sol. 7e mém. 4°. (*Mém. acad. sc., Paris*, xxxii., *p.* 665.)

* || ——— Sur la température des couches terrestres au-dessous du sol jusqu'à 36 mètres de profondeur. 8e mém. 4°. (*Mém. acad. sc., Paris*, xxxii., *p.* 721.)

* || ——— Note sur la psychrométrie électrique. 4°. [*Mém. acad. sc., Paris*, xxxii., *p.* 569.]

* || ——— Mémoire sur les zones d'orages à grêle dans les départements du Loiret, de Loir-et-Cher et de Seine-et-Marne et sur l'influence qu'exercent sur elles plusieurs causes locales. Communiqué . . . 13 nov. 1865. 4°. (*Mém. acad. sc., Paris*, xxxv., 1866, *p.* 689.)

* || ——— Mémoire sur les zones d'orages à grêle dans les départements d'Eure-et-Loir et Loir-et-Cher. 4°. (*Mém. acad. sc., Paris*, xxxvi., 1870, *p.* 83.)

* || ——— Mémoire sur les pluies. 4°. [*Mém. acad. sc., Paris*, xxxvi., 1870, *p.* 121.]

* || ——— Recherches sur la cause des phénomènes lumineux de l'atmosphère et des espaces planétaires, pouvant avoir une origine électrique. Lu . . . 12 nov. 1872. 4°. (*Mém. acad. sc., Paris*, xxxviii., 1873, *p.* 395.)

* || ——— **et E.**—Mémoire sur la température des sols couverts de bas végétaux ou dénudés. Lu . . . 6 nov. 1871. 4°. [*Mém. acad. sc., Paris*, xxxviii., 1873, *p.* 251.]

* || ——— ——— Mémoire sur la température des sols couverts de bas végétaux et dénudés pendant une saison pluvieuse, observée avec le thermomètre électrique. 4°. [*Mém. acad. sc., Paris*, xxxviii., 1873, *p.* 633.]

* || ——— ——— Mémoire sur la température de deux sols semblables, l'un dénudé, l'autre couvert de gazon, observée avec le thermomètre électrique pendant les années, 1873–74. Lu . . . 13 fév. 1874 et 29 mars 1875. 2 parts. 4°. (*Mém. acad. sc., Paris*, xl.)

* || ——— ——— Mémoire sur la température de l'air à la surface du sol et de la terre jusqu'à trente-six mètres de profondeur, ainsi que sur la température de deux sols, l'un dénudé, l'autre couvert de gazon, pendant les années 1875–77. Lu . . . . 1875, 1877, 1878. 3 parts. 4°. (*Mém. acad. sc., Paris*, xli.)

For continuation see *Becquerel, E. et H.*

* || ——— ——— Observations de température faites au Muséum d'Histoire Naturelle pendant les années météorologiques 1875–1877 avec les thermomètres électriques placés sous le sol depuis la surface jusqu'à 36 mètres de profondeur ainsi que dans l'air au nord et à 20 mètres au-dessus du sol. Extrait Mém. acad. sc. 1876–78. la. 4°. (*Nouv. arch. mus. hist. nat., Paris*, 2e *sér.*, ii., *p.* 157.)

For continuation see *Becquerel, E. et H.*

* || **Becquerel, E. et H.**—Mémoire sur la température de l'air à la surface du sol et de la terre jusqu'à trente-six mètres de profondeur, ainsi que sur la température de deux sols, l'un dénudé, l'autre couvert de gazon, pendant les années 1878–1880. 3 parts. 4°. (*Mém. acad. sc., Paris*, xlii.)

For previous years see *Becquerel, [A. C.] et E.*

* || ——— ——— Observations de température faites au Muséum d'Histoire Naturelle pendant les années météorologiques 1878–1882 avec les thermomètres électriques placés sous le sol, depuis la surface jusqu'à 36 mètres de profondeur, ainsi que dans l'air, au nord, et à 20 mètres au-dessus du sol. Extrait des Mém. acad. sc. 1879–83. 4 parts. la. 4°. (*Nouv. arch. mus. hist. nat., Paris*, 2e *série*, iii. *p.* 297; iv. *p.* 359; v. *p.* 389; vi. *p.* 299.)

For previous years see *Becquerel, [A. C.] et E.*

Belize.—Summary of meteorological observations at St. Joseph's Observatory during the months of Jan.—Dec. 1888–89. 4°. Sheets. (*The Angelus, Belize*, iv.–v., 1888–89.)

|| **Berg, E.**—Die Gewitter Russlands im Jahre 1886. Der Akademie vorgelegt am 7 Nov. 1889. sm. f°. (St. Petersburg), 1890. (*Repert. Meteor., Bd.* xiii., *No.* 5.)

Berlin, Deutsche meteorologische Gesellschaft.—Berliner Zweigverein der Deutschen meteorologischen Gesellschaft. Siebentes Vereinsjahr, 1890. 8°. Berlin, 1890.

——— **hydrographisches Amt des Reichs-Marine-Amts.**—Allgemeine Inhalts-Uebersicht und ausführliches Sach- und Namen-Register der Jahrgänge 1873–1888 der Annalen der Hydrographie und Maritimen Meteorologie. Ann. der Hydr. und mar. Meteor., 1889, Heft vii. la. 8°. Berlin, 1889.

——— ——— Annalen der Hydrographie und maritimen Meteorologie. xvii. Jahrg. 1889. la. 8°. Berlin, s.a.

——— **Königlich Preussisches meteorologisches Institut.**—Ergebnisse der meteorologische Beobachtungen im Jahre 1887. Herausgegeben von . . . **W. von Bezold.** la. 4°. Berlin, 1889.

|| ——— ——— Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1889, Jan.—Dec. la. 4°. (*Statist. Korresp.*)

Bibliothèque Universelle [et Revue Suisse]. Archives des sciences physiques et naturelles.—Troisième periode. Tomes xxi.–xxii. 2 vols. 8°. Genève, 1889.

|| **Billwiller, R.**—Vergleichende Resultate der durch Schätzung erhaltenen Daten über den mittleren Bewölkungsgrad des Himmels und der Aufzeichnungen des Sonnenscheinautographen. sm. 8°. (*Vierteljahrs. Zürcher naturf. Gesellsch.*, 1888, *p.* 293.)

|| **Birkner, O.**—Die wissenschaftlichen Erhebungen zur Wasserkatastrophe in der sächsischen Oberlausitz am 18 Mai 1887. sm. f°. (*Meteor. Zeitschr.*, 1889, *Okt.*, *p.* 361.)

|| ——— Spezieller Bericht über die Forschungen bezüglich der Gewitter- und Hagelerscheinungen während des Jahres 1887. la. 4°. (*Jahrb. k. sächs. meteor. Inst.*, 1887, *Anh.* 5.)

* **Blanford, H. F.**—A practical guide to the climates and weather of India, Ceylon and Burmah, and the storms of Indian seas, based chiefly on the publications of the Indian Meteorological Department. la. 8°. London, 1889.

|| **Blodget, L.**—Climatology of Pennsylvania. la. 8°. Harrisburg, 1889. (*Ann. Rep. Sec. Internal Affairs, Penn.*, 1888, *p.* A 107.)

Bombay, Government Observatory.—Magnetical and meteorological observations made at the Government Observatory, Bombay, in the year 1887, under the direction of **C. Chambers** and **C. Chambers, Junior.** la. 4°. Bombay, 1889.

(——— ———) Report on the condition and proceedings of the Government Observatory, Colába, for the year which ended with the 30th June, 1889. f°. s.l.e.a.

Borneo.—Handbook of British North Borneo . . . With an introduction by **Sir R. Alcock.** 8°. London, 1886.

* || **Brewster, Sir D.**—Report on the hourly meteorological register kept at Leith Fort in the years 1826 and 1827. Read 19 Feb. 1866. 4°. [*Trans. R. Soc. Edinb.*, xxiv., 1867, *p.* 351.]

Brisbane, Chief Weather Bureau.—Meteorological instructions by **C. L. Wragge.** sm. f°. Brisbane, 1889.

——— ——— Meteorological report for 1887. sm. f°. s.l.e.a.

——— ——— Telegraphic code and special notice to observers. f°. (Brisbane, s.a.)

——— **Post and Telegraph Department, Meteorological Branch.**—Brisbane observatory, Wickham Terrace. Meteorological synopsis. 1889, Jan.–Dec. f°. Sheets.

——— ——— Table of rainfall during the months Jan.—Dec., 1889. f°. Sheets.

——— ——— Weather chart of Australasia. 1889, Jan. 1—Dec. 31. la. f°. Sheets.

Brussels, Observatoire Royal.—Annuaire . . . par F. Folie. 1886–1889. 53e–57e Années. 5 vols. 18°. Bruxelles, 1885–90.

——— ——— Bulletin météorologique. 1889, Jan. 1—Dec. 31. f°. Sheets.

Buchan, A.—Report on atmospheric circulation. See *Edinburgh Challenger Office.*

Bucharest, Academia Romana.—Analele. Serie ii. Tom. x., 1887–88. 2 vols. 4°. Bucuresci, 1889.

——— **Institutul Meteorologic al Romaniei.**—Analele . . . de **S. C. Hepites.** Tom. iii., 1887. la. 4°. Bucuresci, 1889.

In the French language also.

——— ——— Instructiuni pentru compunerea telegramelor meteorologice. De **S. C. Hepites.** 8°. Bucuresci, 1885.

——— ———Instructiuni relative la observatiunile asupra fenomenelor vegetatiunei si asupra animalelor pentru climatologia unei regiuni. la. 8°. Bucuresci 1886.

|| ——— ——— Raport asupra lucrărilor Institutului Meteorologic in anii 1886–88. 2nd and 3rd. 2 vols. la. 4°. Bucuresci, 1888–89. (*Anal. Inst. Meteor. Roman., Tom.* i., ii., 1886, 1887.)

In the French language also.

* **Bushell, R.**—Twenty-five years' rainfall in Wirrall, North-West Cheshire. la. 8°. Chester, 1889.

Busin, [P.]—Quelques considérations générales sur les cartes du temps et spécialement sur les types isobariques en Italie. la. 8°. (*Assoc. franç. avanc. sc., Congrès de Nancy,* 1886.)

|| ——— **P.**—Le temperature nell' Emilia, nella Lombardia e nel Veneto. 4°. Bologna, 1888. (*Mem. R. Accad. Sc. Ist. Bologna, serie* iv., *Tom.* ix., 1888, *p.* 431.)

|| ——— Sulle predizioni del tempo. la. 8°. Roma, 1888. (*Riv. Maritt.,* 1888, *Marzo.*)

|| ——— Le temperature in Italia. sm. f°. Torino, 1889. [*Boll. Mens. Osserv. Centr. Moncalieri, Ser.* ii., *vol.* ix., *N.* 4, 9, 10.]

(Calcutta, Meteorological Office, Bengal.)—Administration report of the meteorological Reporter to the Government of Bengal for the year 1888-89. sm. f°. s.l.e.a.

[——— ———] Bay of Bengal weather Chart. 1889, Jan. 1—Dec. 31. sm. f°. Sheets.

——— ——— Bengal daily weather report. 1889. sm. f°. Sheets.

These reports are only published during the rainy season.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the weeks ending January 4, 1889, to January 3, 1890. f°. Sheets.

——— ——— Meteorological and rainfall table of the Province of Bengal for the months of January to December 1889, with annual tables. sm. f°.

——— ——— Meteorological summary of the monsoon period of 1889. sm. f°. s.l.e.a.

[Calcutta, Meteorological Office, India.]—Report on the meteorology of India in 1887. By **J. Eliot.** 13th year. f°. Calcutta, 1889.

——— ——— Results of the meteorological observations taken at the Alipore Observatory from 30th Dec. 1888 to 4th Jan. 1890. sm. f°. Sheets.

Calcutta, Meteorological Office, India.—Abstract of the results of meteorological observations taken at the Alipore Observatory in the months of Jan.—Dec. 1889. sm. f°. Sheets.

——— ——— Results of the barometrical and thermometrical observations taken at the Meteorological Office, Chowringhee, from 30th December 1888 to 4th January 1890. sm. f°. Sheets.

——— ——— Abstract of the results of the barometric and thermometric observations taken at the Meteorological Office, Chowringhee. 1889, Jan.—Dec. sm. f°. Sheets.

[——— ———] Indian daily weather report. 1889, Jan. 1—Dec. 31. f°. Sheets.

[——— ———] Meteorological observations recorded at seven stations in India in the year 1888, corrected and reduced. Published . . . under the direction of **H. F. Blanford.** f°. Calcutta, 1889.

[——— ———] Preliminary report on the meteorology for the year 1888, prepared in the Meteorological Office, Government of India. f°. (Simla, 1889.)

[——— ———] Report on the administration of the meteorological department of the Government of India in 1888–89. f°. s.l.e.a.

"Calliope," (H.M.S.) at Apia, Samoa, March 20, 1889. Report of proceedings. sm. f°. London, 1889.

——— ——— Report of the hurricane at Samoa on the 16th March 1889, in continuation of parliamentary paper No. 5732 of 1889. sm. f°. London, 1889.

Cambridge (Mass.), Astronomical Observatory of Harvard College.—Annals of the astronomical observatory of Harvard College. Vol. xx., Parts i. and ii. Observations made at the Blue Hill meteorological observatory, Massachusetts, U.S.A., in the years 1887 and 1888 . . . under the direction of **A. L. Rotch.** 2 vols. la. 4°. Cambridge, 1889.

——— **New England Meteorological Society.**—Bulletin. 1889, Jan.—Dec. Nos. 51–62. 4°. s.l.e.a.

Cambridge Philosophical Society.—Proceedings. Vol. vi., 1886–89. 8°. Cambridge, 1889.

‖ **Canino, V.**—Il clima di Napoli. (Da osservazioni meteorologiche fatte nel R. Osservatorio astronomico di Capodimonte.) 1821–1887. sm. f°. Roma, 1889. (*Annal. Uff. Centr. Meteor. e Geodinam.*, ix., 1887, *Parte* i.)

Cape Town, Meteorological Commission, Cape of Good Hope.—Report . . . for the year 1888. sm. f°. Cape Town, 1889.

Carlsruhe, Centralbureau für Meteorologie und Hydrographie im Grossherzogthum Baden.—Deutsches meteorologisches Jahrbuch für 1888. Grossherzogthum Baden. Die Ergebnisse der meteorologischen Beobachtungen im Jahre 1888. Bearbeitet von **Ch. Schultheiss.** la. 4°. Karlsruhe, 1889.

[——— **Centralbureau für Meteorologie und Hydrographie.**]—Ergebnisse der Beobachtungen der meteorologischen Stationen des Grossherzogthums Baden im Jahre 1887. Nach den Angaben der meteorologischen Centralstation Karlsruhe. la. 8°. (*Statist. Jahrb. Grossh. Baden*, 1887.)

——— ——— Uebersicht der Ergebnisse der an den badischen meteorologischen Stationen angestellten Beobachtungen, nebst Wasserstandsaufzeichnungen an den wichtigsten Hauptpegeln des Rheins. 1889, Jan.—Dec. f°. Sheets.

Cela, J. B. R. de.—Restúmen de las observaciones meteorológicas hechas en la estación de Vilafranca del Panadés durante el segundo semestre del año, 1888. 8°. Vilafranca, 1899.

The first half of 1888 not published.

* **Chappell, E.**—Voyage of His Majesty's ship "Rosamond" to Newfoundland and the southern coast of Labrador. la. 8°. London, 1818.

Chemnitz, K. Sächsisches meteorologisches Institut.—Deutsches meteorologisches Jahrbuch für 1887, 1888. Beobachtungs-System des Königreiches Sachsen. 2 vols. la. 4°. Chemnitz, 1888–89.

‖ **[Christie, W. H. M.]**—Areas of faculæ and sun-spots, compared with diurnal ranges of magnetic declination, horizontal force, and vertical force, as observed at the Royal Observatory, Greenwich, in the years 1873 to 1888. 8°. (*Monthl. Not. R. Astr. Soc., L., No.* 1.)

Christie, W. H. M.—Collected results of the photographic measures of sun-spots made from the Greenwich series of photographs, commencing with the year 1874. (With remarks by **W. Ellis** on the comparison of magnetic variations with sun-spot variations. Read before the R. Astr. Soc., May 10, 1889.) 8°. (*Observatory*, xii., 1889, *p.* 234.)

|| [——— ———] Mean daily area of sun-spots for each degree of solar latitude for each year from 1874 to 1888, as measured on photographs at the Royal Observatory, Greenwich. 8°. (*Monthl. Not. R. Astr. Soc., L., No.* 1.)

* **Ciel et Terre.**—Revue populaire d'astronomie, de météorologie, et de physique du globe. 2e série, année v.; 1er Mars 1889—16 Février 1890. 8°. Bruxelles, s.a.

Coimbra, Observatorio meteorologico e magnetico da Universidade.—Observações meteorologicas feitas . . . no anno de 1888. f°. Coimbra, 1889.

|| **Colladon, D.**—Sur la durée de l'éclair. 4°. (*Compt. rend. acad. sc.*, cix., 1889.)

|| **Colombo, Surveyor General's Office.**—Report on the meteorology of Ceylon for 1888. By **F. C. H. Clarke.** sm. f°. (*Ceylon Administr. Rep.*, 1888, *part* ii., *p.* 35 B.)

——— ——— Results of meteorological observations in Ceylon during the months of January to December 1889. f°. Sheets. (*Suppl. to the Ceylon Gov. Gazette*, 1889–90.)

Combe, J.—Meteorological diagrams illustrating the temperature of sea and air over a period of nine years, 1859–1867, and shewing the intimate connection and beneficial influence of the tidal waters in Torbay for maintaining the mild and equable climate of Torquay. la. f°. s.l.e.a.

|| **Contarino, F.**—Nota sulle acque sotterranee della città di Napoli. sm. f°. (*Rel. sulle Fognatura d. città di Napoli*, 1888, *Ott.*)

|| ——— ——— Nota sulle registrazioni del pluviografo Richard negli anni 1886 e 1887, e sulla loro applicazione al calcolo del regime idraulico dei collettori alto e medio della fognatura della città di Napoli. sm. f°. (*Relaz. sulle Fognatura d. Città di Napoli*, 1888, *Ott.*)

* || **Cooper, J. T.**—Description of a hydropneumatic baroscope. la. 4°. London, 1839. (*Phil. Trans.*, 1839, *part* ii., *p.* 425.)

Copenhagen, Dansk Meteorologisk Institut.—Bulletin météorologique du Nord, publié par les Instituts météorologiques de Norvége, de Danemark et de Suède. Année 1889. Oblong 8°. Copenhague, s.a.

——— ——— Maanedsoversigt over Vejrforholdene. 1889, Jan.—Dec. f°.

——— ——— Meteorologisk Aarbog. 1885–1887. 3 vols., f°. Kjøbenhavn, 1886–88.

In the French language also.

——— **Institut Météorologique de Danemark.**—Exploration internationale des régions arctiques. 1882–83. Expédition Danoise. Observations faites à Godthaab. Tome ii., iie Livr. sm. f°. Copenhague, 1889.

——— **Kongelige Danske Videnskabernes Selskab.**—Oversigt over det . . . . Forhandlinger og dets Medlemmers Arbejder i Aaret. 1887. la. 8°. Kjøbenhavn, 1888–89.

Copenhagen und Hamburg, Dänisches meteorologisches Institut und Deutsche Seewarte.—Tägliche synoptische Wetterkarten für den nordatlantischen Ozean und die anliegenden Theile der Kontinente. Drittes und Viertes Quart., Juni—Nov. 1885. 2 vols. f°. Copenhague et Hambourg, 1888–89.

In the French language also.

* **Cowe, Rev. J.**—The meteorological register kept at Sunbury Vicarage, Middlesex, by the Rev. J. Cowe. 1795 to 1839. Reproduced, by permission, from the original MS. in the Jenyns Library, R. Lit. and Sc. Inst., Bath; and printed for Subscribers only. f°. London, 1889.

|| **Cracow, C. K. Akademii umiejętności w Krakowie.**—Materyjały do klimatografii Galicyi zebrane przez sekcyę meteorologiczną komisyi fizyograficznej. 1888. la. 8°. Kraków, 1889. (*Odbitek ze Sprawozd. Kom. fizyogr.*)

——— **K. K. Sternwarte in Krakau.**—Meteorologische Beobachtungen. 1889, Jan.—Dec., and Results. la. 8°. Sheets.

Croydon, Microscopical and Natural History Club.—[Daily rainfall at stations in Kent and Surrey.] 1889, Jan.—Dec. 4°. Sheets.

Davis, G. G.—Ligeros apuntes sobre el clima de la República Argentina. 4°. Buenos Aires, 1889.

|| **Davis, W. M.**—The physical features of New England. Two chapters on the physical geography and the climate of New England. la. 8°. Cambridge, Mass., 1888. (*From Introd. to the Butterflies of New Engl., by S. H. Scudder.*)

|| ——— Some American contributions to meteorology. A lecture delivered before the Franklin Inst., Nov. 19, 1888. la. 8°. (*Journ. Frankl. Inst., Philad.*, cxxvii., 1889, *Feb.—Mch.*)

|| **Davis, W. M., and Curry, C. E.**—Ferrel's convectional theory of tornadoes la. 8°. (*Amer. Meteor. Journ.*, vi., 1889–90, *pp.* 337, 418, 448.)

* || **Davy, J.**—Notice of an unusual fall of rain in the Lake District, in January 1829. Read 4 Apl. 1859. 4°. [*Trans. R. Soc. Edinb.*, xxii., 1861, *p.* 41.)

[Dehra Dun, Surveyor General of India.]—General report on the operations of the Survey of India Department . . . during 1887–88. Prepared under the direction of Colonel **H. R. Thuillier.** sm. f°. Calcutta, 1889.

|| **Denza, F.**—I terremoti di Novembre e di Dicembre 1887 in Italia. la. 8°. Torino, 1888. (*Boll. Mens. Osserv. Moncalieri, serie* ii., viii., *N.* 1 *e* 2.)

|| ——— ——— I primi cultori italiani dell' aeronautica. 8°. Torino, 1889. (*Ateneo Religioso.*)

|| ——— ——— La inclinazione magnetica a Torino e nei dintorni. la. 8°. Torino, 1889. (*Att. R. Accad. Sc. Torino*, xxiv.)

——— ——— Le valanghe degli inverni 1885 e 1888. 8°. Torino, 1889. (*Boll. Club. Alp. Ital.*, xxii., *N.* 55.)

|| **Dickson, H. N.**—The temperature of the surface of the sea on the east coast of Scotland. la. 8°. [*Journ. Scott. Meteor. Soc.*]
Proof copy.

Dove, K.—Kulturzonen von Nord-Abessinien. Ergänzungs. No. 97 zu Petermanns Mitteil. 4°. Gotha, 1890.

Dublin, General Register Office.—Quarterly returns of the marriages, births, and deaths registered in . . . Ireland; . . . . . 1889. 1st—4th quarters, Nos. 101–104. la. 8°. Dublin, 1889–90.

——— ——— Weekly returns of births and deaths in Dublin (including its suburban districts), and in fifteen of the principal urban sanitary districts in Ireland, 1889. Vol. xxvi. la. 8°. Dublin, 1890.

——— **Royal Irish Academy.**—Proceedings. 2nd series, vol. iv. Science. 8°. Dublin, 1884–88.

[Eberswalde, Hauptstation des forstlichen Versuchswesen in Preussen.]—Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von **A. Müttrich.** Fünfzehnter Jahrg. 1889, Jan.—Dec. 8°. Berlin, s.a.

[——— ———] Jahresbericht über die Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Königreichs Württemberg, des Herzogthums Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von Dr. **A. Müttrich.** xiv., Jahrg., 1888. 8°. Berlin, 1889.

Edinburgh, Challenger Office.—Report on the scientific results of the voyage of H.M.S. "Challenger" during the years 1873-76 . . . . Physics and Chemistry. Vol. ii., Part v. Report on atmospheric circulation by **A. Buchan.** la. 4°. London, 1889.

——— **Scottish Meteorological Society.**—Journal. 3rd series, vol. viii. la. 8°. Edinburgh, 1889.

Egeson, C.—Climatological charts of Australia for July, 1889. 4°. Sheet.

——— Egeson's weather system of sun-spot causality, being original researches in solar and terrestrial meteorology. 8°. Sydney, 1889.

——— Rainfall map of New South Wales, from May 1 to June 11, 1889, compiled from official records. f°. Sheets. (*The Pastoralist, May* 10—*June* 14, 1889.)

——— Remarks on the weather. Some features of the Australian climate. Diminishing the rainfall. Meteorological miscellany. 3 articles. Some causes of droughts and floods. A retrospect and forecast. f°. Sheets. (*The Pastoralist, Sydney, May* 10—*June* 14, 1889.)

Egeson, C.—The daily area of rainfall in New South Wales for April, May, and June 1889. la. 8°. Sheet.

|| **Ekholm, N.**—Sur la chaleur latente de vaporisation de l'eau et la chaleur spécifique de l'eau liquide. 8°. Stockholm, 1889. (*K. Svenska Vet.-Akad. Handl., Bd.* 15, *Afd.* i., *No.* 6.)

Emden, Naturforschende Gesellschaft.—Jahresbericht. 72 und 73. 1886–88. 8°. Emden, 1889.

England and Wales.—Map showing lines of equal magnetic declination for the year 1890. Suppl. to "Colliery Guardian," 1890, Jan. 3. la. 4°. Sheet.

* **Evans, F. J., and Smith, A.**—Admiralty manual for the deviations of the compass. 5th edition. la. 8°. London, 1882.

* || **Everett, J. D.**—Investigation of an expression for the mean temperature of a stratum of soil, in terms of the time of year. Read 3 Feb. 1862. 4°. [*Trans. R. Soc. Edinb.*, xxiii., 1864, *p.* 21.]

Falmouth, Royal Cornwall Polytechnic Society.—Annual report, 1888. 56th. 8°. Falmouth, [1889.]

* **Farr, W.**—A medical guide to Nice; containing every information necessary to the invalid and resident stranger. With separate remarks on all those diseases to which its climate is calculated to prove injurious or beneficial, especially consumption and scrofula. Also observations on the climate of Bagnéres de Bigorre, as the most eligible summer residence for consumptive patients. 8°. London, 1841.

* **Ferrel, W.**—A popular treatise on the winds: comprising the general motions of the atmosphere, monsoons, cyclones, tornadoes, waterspouts, hailstorms, etc., etc. la. 8°. New York, 1889.

Findlay, A. G.—A directory for the navigation of the Indian Archipelago, and the Coast of China, from the Straits of Malacca and Sunda, and the Passages east of Java, to Canton, Shanghai, the Yellow Sea, and Korea, with descriptions of the winds, monsoons and currents, and general instructions for the various channels, harbours, etc. 3rd edition. la. 8°. London, 1889.

Fineman, C. G.—Spegelnefoskopet och dess användning vid molnobservationer. 8°. Stockholm, 1889.

|| **Fines, —.**—Revue climatologique, météorologique, agricole et sanitaire de l'année 1888 à Perpignan. 4°. [*Bull. météor. Pyr.-Orient.*, xvii., 1888, *p.* 82.]

Fiume, K. K. Marine-Akademie.—Meteorologische Beobachtungen. 1889, Jan.—Dec., and Results. la. 8°. Sheets.

|| **Fogs** at sea. f°. Sheet. (*Liverpool Journ. Commerce*, 1888, *Oct.* 13.)

* || **Forbes, J. D.**—Account of a thermometrical register kept at Dunfermline by the Rev. H. Fergus, from 1799 till 1837, with the principal results. Read 6 Mch. 1860. 4°. [*Trans. R. Soc. Edinb.*, xxii., 1861, *p.* 357.]

|| **Fox, W. L.**—Meteorological tables for West Cornwall and the Scilly Islands, also additional meteorological tables for Falmouth, for the year 1888, with notes. 8°. (*Ann. Rep. R. Cornw. Polyt. Soc.*, 1888.)

Frankfurt am Main, Physikalischer Verein.—Jahresbericht . . . für das Rechnungsjahr 1887–1888. 8°. Frankfurt a/M., 1889.

* **Fritz, H.**—Die wichtigsten periodischen Erscheinungen der Meteorologie und Kosmologie. Internat. wissensch. Bibl. lxviii. Bd. sm. 8°. Leipzig, 1889.

|| **(Garde, V., Holm, G. og Crone, C.)**—Magnetiske Observationer, Nordlys-Iagttagelser og Vandstands-Maalinger. 1883–85. la. 8°. Kjøbenhavn, 1888. (*Meddelelser om Grønland*, ix., *p.* 313.)

|| **Gasparis, A. de.**—Discussione e confronto con gli anni precedenti dei valori meteorici ottenuti durante l'anno 1888 nella Specola di Capodimonte. la. 4°. (*Rend. R. Accad. Sc. Fis. Mat., Fasc.* 2°, 1889, *Feb.*)

Geneva, Société de Géographie de Genève.—Le Globe. Journal géographique. Tome xxviii. Quatrième série, Tome viii. 8°. Genève, 1889.

* **Geographisches Jahrbuch.** Begründet 1866 durch E. Behm. Herausgegeben von **H. Wagner.** Bd. viii.–x., 1880–84. 3 vols. sm. 4°. xi.–xii., 1887–88. 2 vols. 8°. Gotha, 1881–88.

* **Giberne, A.**—The ocean of air. Meteorology for beginners. With a preface by **Rev. C. Pritchard.** sm. 8°. London, 1890 [1889.]

Gibson, J.—Report on observations relating to the physics and chemistry of the North Sea during 1888 and 1889, and including a review of the analytical work hitherto undertaken for the Fishery Board for Scotland. la. 8°. (*7th Ann. Rep. Fish. Board Scotland*, 1888, *part* iii., *p.* 409.)

* **Glaisher, J.**—Travels in the air, by **J. Glaisher, C. Flammarion, W. De Fonvielle,** and **G. Tissandier.** Edited by J. Glaisher. Second and revised edition. la. 8°. London, 1871.

‖ **Glyde, E. E.** — Abstract of meteorological observations made at Kirkham, Babbacombe, Torquay, during the year 1889. f°. Sheet. (*Reprinted from the Torquay Directory.*)

González, B. G.—Resumen de 11 años de observaciones meteorologicas en el Colegio del Estado de Puebla. 4°. Puebla, 1889.

(Grant, R.)—Analysis of the results of meteorological observations made with self-recording instruments at the Glasgow University Observatory in the year 1888. 8°. Glasgow, 1889.

Gratz, naturwissenschaftlicher Verein für Steiermark.—Mittheilungen. Jahrg. 1888. la. 8°. Graz, 1889.

‖ **Greenland.**—Observations météorologiques et nautiques faites à Nennortalik et à Augmagsalik par les membres de l'expédition de M. le Capitaine G. Holm pour explorer la côte est du Groenland. 1883–85. la. 4°. [*Exploration Internat. des régions arctiques*, 1882–83. *Expéd. Danoise. Tome* ii.]

‖ ——— Résumé des communications sur le Grønland. Neuvième partie. Sur l'expédition entreprise en 1883–85 sur la côte orientale du Grønland. la 8°. [*Meddelelser om Grønland*, ix., *p.* 355.]

Greenwich, Royal Observatory.—Reduction of the photographic records of the barometer, 1874 to 1876, and of the dry-bulb and wet-bulb thermometers, 1869 to 1876, made at the Royal Observatory, Greenwich, under the direction of **W. H. M. Christie.** Forming App. I. to Greenwich Obsns. for 1887. la. 4°. London, 1889.

——— ——— Report of the Astronomer Royal to the Board of Visitors. 1889. la. 4°. s.l.e.a.

——— ——— Results of the magnetical and meteorological observations made at the Royal Observatory, Greenwich, in the year 1887 : under the direction of **W. H. M. Christie.** la. 4°. London, 1889.

Greenwood, W. N.—A discussion of a series of tidal observations, taken at 18 stations on the West Coast of England and Scotland, to determine the effect of atmospheric pressure on the wave, during November 1888. f°. s.l.e.a.

——— Kludonometric tide tables for the Lancashire Coast and Bristol Channel. . . . 1890. sm. 8°. Lancaster, [1889.]

* **Griffin, C., and Co.**—Year-book of the scientific and learned societies of Great Britain and Ireland : comprising lists of the papers read during 1888 . . . with the names of their authors. 6th annual issue. 8°. London, 1889.

Guanajuato, Observatorio Meteorológico del Colegio del Estado.—Resúmen de las observaciones practicadas en el Colegio del Estado, Guanajuato, México, durante el año meteorológico de 1887 á 1888. sm. f°. Sheet.

Guelph, Ontario Agricultural College.—Report of observations taken at the Ontario Agricultural College during 1888. la. 8°. (*14th Ann. Rep. Ont. Agric. Coll.*, 1888. *Sessional Papers*, xxi., 1889, *Part* iv., *No.* 21.)

——— ——— Soil temperatures, rainfall and drainage waters. 1888. la. 8°. (*14th Ann. Rep. Ont. Agric. Coll.*, 1888. *Sessional Papers*, xxi., 1889, *Part* iv., *No.* 21.)

* **Guillaume, C. E.**—Traité pratique de la thermométrie de précision. la. 8°. Paris, 1889.

* **Hakluyt, R.**—Voyages in search of the North-West Passage. (Edited by H. Morley.) 18°. London, 1887.

Halle, Kaiserliche Leopoldino-carolinische Deutsche Akademie der Naturforscher.—Leopoldina. Heft xxiv. Jahrg. 1888. la. 4°. Halle, 1888.

|| **Hamberg, H. E.**—Om skogarnes inflytande på Sveriges klimat. III. Luftens fuktighet. la. 4°. Stockholm, 1889. (*Bihang till Domänstyrelsens underdåniga berättelse rörande skogsväsendet för år* 1887.)

Hamburg, Deutsche Seewarte.—Aus dem Archiv der Deutschen Seewarte. viii.—xi., Jahrg., 1885–88. 4 vols. la. 4°. Hamburg, 1887–1889.

——— ——— Deutsches meteorologisches Jahrbuch für 1887–88. Beobachtungs-System der Deutschen Seewarte. Ergebnisse der meteorologischen Beobachtungen . . . Jahrg. x.–xi. (Vorwort von **G. Neumayer.**) 2 vols. sm. f°. Hamburg, 1889.

——— ——— Deutsche ueberseeische meteorologische Beobachtungen. . . . Heft ii. Die Beobachtungen von Labrador 1885. . . . Walfischbay, 1887. sm. f°. s.l.e.a.

——— ——— Ergebnisse der meteorologischen Beobachtungen im Systeme der Deutschen Seewarte für die Lustren 1876–1880 und 1881–1885 sowie das Dezennium 1876–1885. f°. Hamburg, 1889.

——— ——— Monatsbericht der Deutschen Seewarte für jeden Monat des Jahres 1888. Jahrg. xiii. la. 8°. Hamburg, s.a.

* ——— ——— Tägliche synoptische Wetterkarten für den nordatlantischen Ozean und die anliegenden Theile der Kontinente.

See *Copenhagen und Hamburg.*

——— ——— Vierteljahrs-Wetter-Rundschau an der Hand der täglichen synoptischen Wetterkarten für den nordatlantischen Ocean des Dänischen meteorologischen Instituts und der Deutschen Seewarte. 1883–84. Bd. i. la. 8°. Berlin, 1888.

——— ——— Wetterbericht. Jahrg. xiv. 1889, Jan. 1.—Dec. 31. f°. Sheets.

|| **Hann, J.**—Bericht über die Fortschritte der geographischen Meteorologie. Umfasst die Jahre 1886, 1887, 1888 bis einschliefslich Oktober. 8°. (*Geogr. Jahrb.*, xiii., *p.* 27.)

|| ——— Beiträge zur arktischen Meteorologie. la. 8°. (*Meteor. Zeitschr.*, 1889, *Sept.*, *p.* 321.)

|| ——— Ueber die Luftfeuchtigkeit als klimatischer Factor. 8°. (*Wien. klin. Wochenschr.*, 1889, *Nr.* 18–19.)

|| ——— Untersuchungen über die tägliche Oscillation des Barometers. la. 4°. Wien, 1889. (*Denkschr. math.-naturw. Cl. k. Akad. Wissensch.*, lv., *p.* 49.)

|| ——— Zur Meteorologie des Sonnblickgipfels. 8°. Wien, 1889. (*Zeitschr. deutsch. oesterr. Alpenver.*, 1889, *Bd.* xx., *p.* 71.)

|| ——— Die meteorologischen Ergebnisse der Lady Franklin Bay-Expedition 1881–83. sm. f°. (*Meteor. Zeitschr.*, 1890, *Jan.*, *p.* 1.)

Hansa.—Zeitschrift für Seewesen. (Redigirt und herausgegeben von **W. von Freeden.**) xxvi. Jahrg., 1889. sm. f°. Hamburg, s.a.

|| **Harding, C.**—Atlantic weather and rapid steamship navigation. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xv., 1889, *p.* 235.)

* **(Harries, H.)**—The Föhn. 8°. (*Longman's Mag.*, 1889, *Oct.*, *p.* 622.)

Hartnup, J.—Report . . . on the arrangements made for enabling mariners to find the Greenwich time at sea by chronometers.

See *Liverpool Observatory.*

Harvard College, Observatory.—Annals of the Astronomical observatory of Harvard College.

See *Cambridge* (*Mass.*).

|| **Hayden, E.**—Tropical cyclones. la. 8°. Philadelphia, 1889. (*United Service Mag.*, 1889, *June.*)

|| ——— Hurricanes in the Bay of North America. Read . . . Oct. 12, 1889. la. 8°. Washington, 1890. (*Bull. Phil. Soc. Wash.*, xi., *p.* 173.)

|| ——— The modern law of storms. la. 8°. Philadelphia, 1890. (*United Service Mag.*, 1890, *Mch.*)

|| **Hector, J.**—[Meteorological observations in New Zealand.] 1888. sm. f°. (*Statist. of New Zealand*, 1888, *p.* 79.)

|| **Hellmann, G.**—Die Anfänge der meteorologischen Beobachtungen und Instrumente. la. 8°. Berlin, 1890. (*Himmel und Erde*, ii *Jahrg.*, 3 *u.* 4 *Heft.*)

Helsingfors, Finska Vetenskaps-Societeten. — Öfversigt af Finska Vetenskaps-Societetens Förhandlingar. xxx., 1887–1888. la. 8°. Helsingfors, 1888.

|| **Hepites, S. C.**—Climat de Bucarest. 1885, 1886. 1er et 2^{me} mém. la. 4°. Bucuresci, 1888–89. (*Anal. Inst. Meteor. Roman., Tom.* ii., iii., 1886, 1887.)

In the Roumanian language also.

|| ——— Détermination de la hauteur du baromètre de l'institut météorologique de Bucarest Ferĕstrĕŭ. la. 4°. (*Anal. Inst. Meteor. Roman., Tom.* ii., *Part* ii. 1886.)

In the Roumanian language also.

——— Instructiuni pentru observarea furtunelor. la. 8°. s.l.e.a.

|| ——— Instructiuni pentru statiunile termo-udometrice. la. 4°. Bucuresci, 1888. (*Anal. Inst. Meteor. Roman., Tom.* ii., *Part.* ii., 1886.)

——— Instructiuni pentru statiunile udometrice. 4°. s.l.e.a.

——— Istoricul studiilor meteorologice in Romania. la. 8°. Bucuresti, 1886.

|| ——— Organisation des stations pour l'étude de la climatologie du Royaume par régions. la. 4°. Bucuresci, 1888 (*Anal. Inst. Meteor. Roman., Tom.* ii., *Part.* ii., 1886–7.)

In the Roumanian language also.

|| ——— Studiŭ asupra climeĭ Bucureştilor in aniĭ 1885–88. Partea i. Temperatura aeruluĭ. 4°. Bucureşti 1889. (*Anal. Acad. Romane., Seria* ii., *Tom.* xi.)

|| **Herrmann, E.**—Der plötzliche Barometerfall über Mitteleuropa am 31 Januar —1 Februar 1889. la. 8°. (*Ann. Hydr. mar. Meteor., Berlin*, 1889, *Heft* vi., *p.* 242.)

* || **Herschel, Sir J. F. W.**—A brief notice of the life, researches, and discoveries of Friedrich Wilhelm Bessel. 8°. London, 1847. (*Ann. Rep. R. Astr. Soc.*)

* || ——— Memoir of Francis Baily, Esq. 8°. London, 1845. (*Month. Not. R. Astr. Soc.*, vi., 1844, *Nov.*)

Hildebrandsson, H.—Rapport sur la classification des nuages. Congrès internat. de météor., Paris. la. 8°. Paris, 1889.

|| **Hill, S. A.**—On temperature and humidity observations made at Allahabad at various heights above the ground. f°. (*Indian Met. Mem.*, iv., *No.* 9, *p.* 361.)

|| ——— The psychrometer and condensing hygrometer. 8°. Calcutta, 1889. (*Journ. Asiat. Soc. Bengal*, lvii., *part* ii., 1888, *p.* 369.)

|| ——— The tornadoes and hailstorms of April and May, 1888, in the Doab and Rohilkhand. Read Nov. 7, 1888. la. 8°. Calcutta, 1889. (*Journ. Asiat. Soc. Bengal*, lviii., *Part* ii., 1889, *p.* 135.)

Hinrichs, G.—Iowa weather report. Report of the Iowa Weather Service. 1878–87. 10 vols. 8°. Des Moines, 1880–89.

* **Hirn, G. A.**—Constitution de l'espace céleste. la. 4°. Paris, 1889.

|| **Hjeltström, S. A.**—Sur la conductibilité de la neige. (*K. Vetensk.-Akad. Förhandl., Stockholm*, 1889, *No.* 10, *p.* 669.)

Hobart, Royal Society of Tasmania.—Papers and proceedings . . . for 1888. 8°. Hobart, 1889.

|| **Hoffmann, H.**—Ueber den praktischen Werth phänologischer Beobachtungen. la. 8°. (*Allg. Forst.-Jagd.-Zeit. von C. Loren und I. Lehr*, 1889, *Apl.*)

|| ——— Ueber phaenologische Accommodation. sm. 4°. (*Botan. Zeit. Leipzig*, 1890, *No.* 6–11.)

Hong-Kong Observatory.—Observations made at the Hong-Kong Observatory in the year 1888, by **W. Doberck.** sm. f°. Hong-Kong, 1889.

——— **Survevor General's Office.**—Report on great [rain] storm of 29th and 30th May, 1889. sm. f° s.l.e.a.

|| **Hoppe, H.**—Ergebnisse der meteorologischen Beobachtungen [im Königreiche Sachsen 1888]. sm. 8°. [*Statist. Jahrb. Kön. Sachs.*, 1890.]

|| **Horn, F.**—Beobachtungen über Gewitter und Hagelschläge in Bayern während der Jahre 1880–88. la. 4°. (*Beob. meteor. Stat. K. Bayern*, x., 1888, *p.* l.)

——— Beobachtungen über Gewitter in Bayern, Württemberg und Baden während des Jahres 1888. la. 4°. (*Beob. meteor. Stat. K. Bayern*, x., 1888, *p.* xix.)

* **Hutchins, D. E.**—Cycles of drought and good seasons in South Africa. sm. 8°. Wynberg, 1889.

A reprint of two lectures entitled :—"Sunspots and Seasons" and "Our climate and its variation in cycles."

Jamaica.—Meteorological observations. Vol. i. Containing reports Nos. 1 to 101, from June 1881 to December 1888, inclusive. sm. f°. Kingston, 1889.

|| ——— Weather report for the months of Jan.—Dec. 1889. sm. f°. Kingston, 1889–90. [*From the Jamaica Gazette.*]

|| **Jantzen, V. W.**—Meteorologiske Observationer i Nanortalik og Angmagsalik, sammenlignede med Observationer fra andre Stationer. 1883–85. la. 8°. Kjøbenhavn, 1888. (*Meddelelser om Grønland*, ix., *p.* 287.)

See also *Greenland.*

* **Jeffries, J.**—A narrative of the two aerial voyages of Dr. Jeffries with Mons. Blanchard; with meteorological observations and remarks. The first voyage, on the 30th of Nov., 1784, from London into Kent: the second, on the 17th of Jan., 1785, from England into France. Read before the R. Soc., Jan. 1786. 4°. London, 1786.

|| **Kammermann, A.**—Résumé météorologique de l'année 1888 pour Genève et le Grand Saint-Bernard. 8°. Genève, 1889. (*Arch. sc. phys. nat.*, 1889, *Août.*)

(Karlinski), [F.]—Stan Wody na rzekach Galicyjskich oraz opad atmosferyczny . . . Water-level in rivers of Galicia together with the precipitation of the atmosphere . . . 1887, 1888. 2 vols. 8°. Kraków, 1889.

* **Kérespert, F.**—Prévision du temps. Météorologie du matelot. sm. 4°. Paris, s.a.

|| **Kew Observatory.**—Report of the Kew Committee for the year ending October 31, 1889. With appendices containing results of magnetical, meteorological, and solar observations made at the observatory. 8°. London, 1889. (*Proc. R. Soc.*, 1889.)

Kew, Royal Gardens.—The weather plant. la. 8°. London, 1890. (*Bull. Misc. Inform.*, 1890, *Jan.*, *No.* 37.)

Kiel, Ministerial-Kommission zur Untersuchung der Deutschen Meere.—Ergebnisse der Beobachtungsstationen an den deutschen Küsten über die physikalischen Eigenschaften der Ostsee und Nordsee und die Fischerei. Jahrg. 1888. Heft i.—xii. Oblong 8°. Berlin, 1890.

Kitto, E.—The Falmouth observatory. 4°. (*Nat. Record*, I., 1889, *Oct.* *p.* 26.)

* || **[Klein, H. J.]**—Die Fortschritte der Meteorologie. No. 14. 1888. sm. 8°. Leipzig, 1889. (*Rev. Naturw. von H. J. Klein.*)

(Koudritzki, M.)—Meteorologhicheskiya nablyudeniya pri Korost'ishevskoĭ uchitel'skoĭ seminarii za 1888-ĭ ghod. Meteor. obsns. at Korostyscheff, 1888. la. 8°. (*Mém. soc. nat. Kiew*, x.,.1889, *Livr.* 2, *p.* 453.)

Krasno, agrarmeteorologisches Observatorium des Neutrathaler landwirtschaftlichen Vereines.—Der Laubfrosch. II. Jahrg., 1889. Sechster Jahrg. der populären meteor. Abhandlungen . . . Redigirt durch **Frh. G. Friesenhof.** la. 4°. Alt-Krasno, 1889.

——— ——— Wetterkalender für Ungarn. 1889. Jahrg. vi. Nos. 1-26. sm. 4°. Sheets.

——— **agrarmeteorologisches Observatorium zu Alt-Krasno (vordem Nedanócz).**—Monatsberichte 1889 über die regelmässigen Beobachtungen. Jan.–Dez. la. 4°. Alt-Krasno, 1889.

* **Kreidel, W.**—Untersuchungen über den Verlauf der Flutwellen in den Ozeanen. la. 8°. Frankfurt a.M., 1889.

Lagos, Colonial Surgeon.—Meteorological observations taken at the Colonial Hospital, Lagos. 1889, Jan.—Dec. f°. Sheets. (*Gov. Gazette*, 1889.)

Lahore, Meteorological Reporter to Government, Punjab.—Summary of meteorological conditions prevailing over the Punjab. 1889. Jan.—Dec. f°. Sheets.

(Lahore, Sanitary Commissioner.)—Report on the sanitary administration of the Punjab for the year 1888. f°. Lahore, 1889.

Lamprecht, G.—Der Wetterring. III. Rundschreiben. 4°. Sheet. (Bautzen, 1889.)

——— Die Erdenringe. Einige Sätze zu der Schrift: "Wetter, Erdbeben und Erdenringe" von G. Lamprecht. 4°. Bautzen, s.a.

‖ **(Lang, C.)**—Bericht über die Thätigkeit der kgl. bayerischen meteorologischen Centralstation und der ihr angeschlossenen Stationen im Jahre 1888. la. 4°. (*Beob. meteor. Stat. K. Bayern*, x., 1888, *p.* ix.)

‖ **Lang, C.**—Fortpflanzungsgeschwindigkeit der Gewitter in Süddeutschland während des zehnjährigen Zeitraumes 1879–88. la. 4°. [*Beob. meteor. Stat. K. Bayern*, x., 1888, *p.* xxxvii.]

‖ ——— Klimatische und meteorologische Verhältnisse. la. 8°. (*Die Landwirthsch. in Bayern*, 1889 ?, *p.* 114.)

Lee, Sir J. C.—The North-West Coast of Africa. la. 8°. (*Journ. Manch. Geogr. Soc.*, ii., 1886, *p.* 145.)
Contains some meteor. obsns.

* **Legrand, É.**—Nouveau dictionnaire Français-Grec moderne contenant les termes de la langue parlée et de la langue écrite. 2 vols. 18°. Paris, s.a.

Leicester Literary and Philosophical Society.—Transactions. New quarterly series. Vol. i., 1886–89. Together with the reports of the Council, 1887–89. 8°. Leicester, 1889.

* **Leslie, Sir John.**—Treatises on various subjects of natural and chemical philosophy. With a biographical memoir (by **M. Napier**). Republished from the Encycl. Brit. 8°. Edinburgh, 1838.

Ley, W. C.—Note on a proposed scheme for observation of the upper clouds. 8°. [Privately printed.] Leicester, s.a.

‖ **Leyst, E.**—Untersuchungen über den Einfluss der Ablesungstermine der Extrem-Thermometer auf die aus ihnen abgeleiteten Extrem-Temperaturen und Tagesmittel der Temperatur. la. 4°. (St. Petersburg), 1889. (*Repert Meteor.*, xiii., *No.* 2.)

Libbey, W., Jr.—The cruise of the Grampus. sm. 8°. (*Princeton Coll. Bull.*, i., 1889, *Nov.*, *p.* 100.)

Lisbon, Observatorio do Infante D. Luiz. — Annaes 1885–86. Vols. xxiii.–xxiv. 2 vols. f°. Lisboa, 1889.

——— ———.Annaes . . . Observações dos postos meteorologicos segundo o plano adoptado no Congresso de Vienna d'Austria. 1885. f°. Lisboa, 1889.

——— ——— Boletim meteorologico. 1889, Jan. 1—Dec. 31. f°. Sheets.

Liverpool Observatory.—Results of meteorological observations made at the Liverpool Observatory, Bidston, Birkenhead, during the years 1879 to 1883. la. 8°. Liverpool, 1884.

——— Report of the Astronomer to the Marine Committee, and results of meteorological observations made at the Liverpool Observatory, Bidston, Birkenhead, during the years 1884 to 1888. la. 8°. Liverpool, 1889.

(———) Report of the Astronomer to the Marine Committee, Mersey Docks and Harbour Board, on the arrangements made, and methods devised and carried out, for enabling mariners to find the Greenwich time at sea by chronometers, more accurately than by the ordinary methods, which have been hitherto adopted. (By **J. Hartnup.**) la. 8°. Liverpool, 1883.

London, Admiralty.—Admiralty manual for the deviations of the compass.
See *F. J. Evans.*

* ——— ——— A catalogue of books in the Admiralty library. By **R. Thorburn.** 4°. London, 1875.

——— ——— Report on the bore of the Tsien-Tang Kiang by Commander Moore.
See *W. U. Moore.*

——— ——— Tide tables for the British and Irish Ports for the year 1889; also the times and heights of high water at full and change for the principal places on the globe. Computed by Staff Captain **H. R. Harris.** la. 8°. London, s.a.

——— **Army Medical Department.**—Annual abstract of meteorological observations taken at Netley and foreign stations in the year 1887. la. 8°. (*Army Med. Dep. Rep.*, 1887, *App.* x., *p.* 376.)

London, Board of Trade.—Abstracts of the returns made to the Board of Trade of shipping casualties . . . from the 1st July 1887 to the 30th June 1888; . . . with charts and appendices. sm. f°. London, 1889.

——— **British Association for the Advancement of Science.**—Report of the fifty-eighth meeting . . . held at Bath in September 1888. 8°. London, 1889.

——— **Colonial and Indian Exhibition, 1886.**—Handbook to Fiji and catalogue of the exhibits. 8°. London, 1886.

Contains Meteorological observations taken at Levuka, from 1st January 1875, to August 1882, and from that period at Suva, to 31st December 1885, by J. D. W. Vaughan.

——— **Committee on Solar Physics.**—Second report. 8°. London, 1889.

* ——— **Edinburgh, and Dublin Philosophical Magazine** and Journal of Science. Conducted by **Sir R. Kane, Sir W. Thomson,** and **W. Francis.** Fifth series. Vols. xxvii.-xxviii., 1889. 2 vols. 8°. London, s.a.

——— **General Register Office.**—Fifty-first annual report of the Registrar-General of births, deaths, and marriages in England. 1888. la. 8°. London, 1889.

——— ——— Quarterly returns of marriages, births and deaths registered in . . . England, Nos. 161–164. 1889. la. 8°. London, 1889–90.

——— ——— Weekly return of births and deaths in London and in twenty-seven other great towns. Vol. l., 1889. Nos. 1–52. la. 8°. London, 1889.

——— **Meteorological Office.**—Charts showing the mean barometrical pressure over the Atlantic, Indian, and Pacific Oceans. la. f°. London, [1888.]

——— ——— Daily weather report, 1889, Jan. 1—Dec. 31. 2 vols. la. 4°. s.l.e.a.

——— ——— Hourly readings from the self-recording instruments at the four observatories under the Meteorological Council. 1886. la. 4°. London, 1889.

——— ——— Meteorological observations at stations of the second order for the year 1885. la. 4°. London, 1889.

——— ——— Report of the Meteorological Council to the Royal Society, for the year ending 31st of March, 1889. la. 8°. London, 1890.

——— ——— The weekly weather report of the Meteorological Office for the year 1889 (vol. vi., second series), containing synoptic charts, and descriptive summaries of the weather for each day; also tabular summaries of temperature, rainfall, and bright sunshine, for each week. With monthly supplement and four appendices. la. 4°. London, s.a.

——— **Royal Astronomical Society.**—Monthly Notices . . . 1888–89. Vol. xlviii. 8°. London, 1889.

* ——— **Royal Geographical Society.**—Hints to travellers, scientific and general. Edited for the Council of the Royal Geographical Society by **D. W. Freshfield** and **W. J. L. Wharton.** 6th edition, revised and enlarged. sm. 4°. London, 1889.

——— ——— Proceedings . . . and monthly record of geography. New monthly series. Vol. xi., 1889. la. 8°. London, 1889.

——— **Royal Institution of Great Britain.**—Notices of the proceedings at the meetings of the Members . . . with abstracts of the discourses delivered at the evening meetings. Vol. xii., 1887–89. With an Index to vols. i.–xii. 8°. London, 1889.

——— **Royal Meteorological Society.**—The meteorological record. Monthly results of observations made at the stations of the R. Meteor. Soc., with remarks on the weather for the year 1888. By **W. Marriott.** Vol. viii. la. 8°. London, 1889.

Contains also "Meteorology of England during the quarters ending March to December 1888." By **J. Glaisher.**

——— ——— Quarterly Journal. Vol. xv., 1889. la. 8°. London, 1889.

——— **Royal Society.**—Proceedings. Vol. xlv.-xlvi., 1888–89. 2 vols. 8°. London, 1889–90.

——— **Royal United Service Institution.**—Journal. Vol. xxxiii. 8°. London, 1889–90.

——— **Society of Arts.**—Journal. Vol. xxxvii. From November 1888 to November 1889. la. 8°. London, 1889.

Long, E. De.—The voyage of the Jeannette. The ship and ice journals of George W. De Long, Lieutenant-Commander U.S.N., and Commander of the Polar Expedition of 1879–1881. Edited by his wife, Emma De Long. 2 vols. la. 8°. London, 1883.

* **Longman's New Atlas,** political and physical, for the use of schools and private persons. Edited by **G. G. Chisholm.** sm. f°. London, 1889.

Loomis, E.—Contributions to meteorology. Chap. iii. Revised edition. la. 4°. New Haven, 1889.

‖ **Luvini, J.**—Les taches solaires et les variations du magnétisme terrestre. la. 8°. Turin, 1889. (*La Lumière Electr.*, xxxii., 1889, *p.* 312.)

McLandsborough, J., and Preston, A. E.—Meteorology of Bradford for 1889. f°. Sheet.

* **M'Leod, A.**—Scripture meteorology and modern science. sm. 8°. Glasgow, 1867.

Madrid, Observatorio.—Observaciones meteorológicas efectuadas en el Observatorio de Madrid durante los años 1886 y 1887. 8°. Madrid, 1889.

——— ——— Resúmen de las observaciones meteorológicas efectuadas en la Peninsula y algunas de sus islas adyacentes durante los años 1884 y 1885. 2 vols. 8°. Madrid, 1889.

Magdeburg.—Jahrbuch der meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung. Herausgegeben von **A. W. Grützmacher.** Jahrg. vii., 1888. la. 4°. Magdeburg, 1889.

Magie, W. F.—Atmospheric electricity at sea. la. 8°. (*Princeton Coll. Bull.*, *I.*, 1889, *No.* 4, *p.* 103.)

Manchester Literary and Philosophical Society.—Memoirs and Proceedings. 4th series, vol. ii. 8°. Manchester, 1889.

Manchester, Sheffield, and Lincolnshire Railway.—Monthly statement of rain fallen in the year ending 31st December, 1889. sm. f°. Sheet.

Margate, Medical Officer of Health.—Report of the medical officer of health for the Borough of Margate, from April 10th, 1888, to the end of the year. sm. 8°. Margate, 1889.

Contains meteor. obsns. for 1888 by **J. Stokes.**

Marinos, Sp. P.—Meteōrologikē epopsis tēs poleōs Kerkuras kata ta etē 1887 kai 1888. Meteorological review of the City of Corfu for the years 1887 and 1888. sm. 8°. Corfu, 1889.

Marriott, W., and Ranyard, A. C.—Photographs of lightning. la. 4°. (*Knowledge*, xii., *No.* 44, 1889, *p.* 165.)

Marseilles, Commission Météorologique du Département des Bouches-du-Rhone.—Bulletin annuel. Années 1887–88. 2 vols. 4°. Marseille, 1888–89.

Mascart, E., et Moureaux, T.—Conférences sur le magnétisme terrestre et l'électricité atmosphérique faites au Bureau Central Météorologique, en Mai 1882. 4°. Paris, 1882.

Mauritius, Royal Alfred Observatory.—Annual report of the Director . . . for the year 1887. f°. s.l.e.a.

‖ ——— ——— Results of meteorological observations at the Royal Alfred Observatory, Mauritius. 1887, 1888. 2 vols. sm. f°. (*Mauritius Blue Book*, 1887, 1888.)

Melbourne Observatory.—Monthly record of results of observations in meteorology, terrestrial magnetism, &c., &c., . . . Under the superintendence of **R. L. J. Ellery.** 1888, Jan.—Dec. la. 8°. Melbourne, s.a.

(———) Reports of the Board of Visitors to the observatory; together with the annual report of the Government Astronomer. 23rd and 24th. sm. f°. Melbourne, s.a.

‖ **Merrifield, J.**—Meteorological summary [for Plymouth] for the year 1889. oblong la. 8°. Sheet. (*Western Daily Mercury*, 1890, *Jan.* 6.)

Meteorologische Zeitschrift—Herausgegeben im Auftrage der **Oesterreichischen Gesellschaft für Meteorologie und der Deutschen meteorologischen Gesellschaft.**—Redigirt von **J. Hann** und **W. Köppen.** VI. Jahrg. (xxiv. Bd. d. Zeitschr. oesterr. Gesellsch. Meteor.), 1889. la. 8°. Wien, s.a.

Mexico, Ministerio de Fomento.—Anales. Tomo viii. la. 8°. México, 1887.

——— **Observatorio Meteorológico-Magnético Central.**—Boletin mensual. Tomo I., 1888. la. 4°. México, 1888.

——— ——— Resúmen comparativo correspondiente á los años de 1877–1888. la. f°. Sheet.

|| **Meyer, H.**—Die Niederschlags-Verhältnisse von Deutschland, insbesondere von Norddeutschland, in den Jahren 1876–1885. 4°. Hamburg, 1889. (*Archiv. Deutsch. Seewarte, Jahrg.* xi., 1888, *No.* 6.)

|| ——— Die Winde zu Keitum auf Sylt, mit einer Einleitung, die Darstellung der Windverhältnisse eines Ortes betreffend. la. 8°. (*Ann. Hydr. mar. Meteor.*, 1890, *Feb.*)

Milan, R. Osservatorio Astronomico di Brera.—Pubblicazioni.
No. xxxiv. See *G. V. Schiaparelli.*
No. xxxv. See *M. Rajna.*

* || **Miller, J. F.**—On the meteorology of the Lake District of Cumberland and Westmoreland; including the results of experiments on the fall of rain at various heights above the earth's surface, up to 3166 feet above the mean sea level. Read May 18, 1848. la. 4°. [*Phil. Trans.*, 1849, *p.* 73.]

* || ——— On the meteorology of the Lake District of Cumberland and Westmoreland; including the results of experiments on the fall of rain at various heights, up to 3166 feet above the sea level. la. 4°. [*Phil. Trans.*, 1849, *p.* 319.]

* || ——— On the meteorology of the Lake District of Cumberland and Westmoreland; with a continuation of the results of experiments on the fall of rain at various heights, up to 3166 feet above the sea level. Read May 30, 1850. la. 4°. [*Phil. Trans.*, 1851, *p.* 149.]

* || ——— On the meteorology of the Lake District of Cumberland and Westmoreland; including the results of experiments on the fall of rain at various heights, up to 3166 feet above the sea level. Fourth paper, for the year 1850. la. 4°. [*Phil. Trans.*, 1851, *p.* 623.]

* || ——— On the meteorology of the English Lake District, including the results of experiments on the fall of rain, the temperature, the dew point, and the humidity of the atmosphere, at various heights on the mountains, up to 3166 feet above the sea level,—for the years 1851–53. Communicated 1st May 1854. la. 4°. [*Trans. R. Soc. Edinb.*, xxi., 1857, *p.* 81.]

* || ——— On the relation of the air and evaporation temperatures to the temperature of the dew-point, as determined by Mr. Glaisher's hygrometrical tables, founded on the factors deduced from the six-hourly observations made at the Royal Observatory, Greenwich. Read May 30, 1850. la. 4°. [*Phil. Trans.*, 1851, *p.* 141.]

|| **Mohn, H.**—Die tägliche Periode der Feuchtigkeit in Christiania. sm. f°. (*Meteor. Zeitschr.*, 1889, *Aug.*, *p.* 281.)

|| ——— The physical conditions of Barents Sea. la. 8°. (*Scott. Geogr. Mag.*, 1889, *Oct.*)

|| ——— Windstärke und Windgeschwindigkeit auf norwegischen Leuchtfeuer-Stationen. la. 8°. (*Ann. Hydr. mar. Meteor. Berlin*, 1889, *Okt.*)

Monaco, Prince Albert de.—Campagnes scientifiques de S. A. S. le Prince Albert de Monaco faites sur son yacht L'Hirondelle en 1885, 1886, 1887 et 1888. Carte dressée . . . par **A. Tollemer.** 1889. Chart. la. f°.

|| ——— Recherches des animaux marins. Progrès réalisés sur L'Hirondelle dans l outillage spécial. la. 8°. Paris, 1889. (*Compt. Rend. Congr Internat. Zool., Paris*, 1889, *p.* 183.)

——— Sur les courants superficiels de l'Atlantique Nord. 4°. (Paris, 1889.) [*Compt. rend. acad. sc., Paris*, 1889.]

Montreal, Geological and Natural History Survey of Canada.—Annual report. New series. Vol. iii., Parts i. and ii., 1887–88. 2 vols., with maps, la. 8°. Montreal, 1889.

|| **Moore, A. W.**—The climate of the Isle of Man. la. 8°. Douglas, 1889. [*Journ. Scott. Meteor. Soc.*, viii., *3rd ser.*, *No.* v., *p.* 200.]

——— **(W. U.).**—Report on the bore of the Tsien-Tang Kiang. Published by . . . the **Admiralty.** la. 8°. London, 1888.

Munich, K. [b.] meteorologische Centralstation.—Beobachtungen der meteorologischen Stationen im Königreich Bayern . . . Herausgegeben . . . durch **C. Lang** und **F. Erk.** x. Jahrg., 1888. sm. f°. München, 1889.

‖ ——— ——— Uebersicht über die Witterungsverhältnisse im Königreiche Bayern. 1889, Jan.—Dec. la. f°. Sheets. (*Separat-Abdruck aus der "Augsburger-Abendzeitung."*)

——— ——— Wetterkarte und Wetterbericht. 1889, Jan. 1.—Dec. 31. oblong f°. Sheets.

‖ **Naples, Reale Osservatorio Astronomico.**—Bullettino meteorologico . . . per **F. Brioschi.** 1888. Anno xxiii., 2ª Serie. sm. f°. Napoli, 1888. (*Rend. R. Accad. Sc. Fis. Mat.*, 1888, *Fasc.* 1° *a* 12°.)

Natal Harbour Board.—Chairman's Minute and departmental reports for the year 1888. sm. f°. Durban, 1889.

* **Nature.**—A weekly illustrated journal of science. Vols. xxxix.-xl. 1888-89. 2 vols. la. 8°. London and New York, 1889.

* **Nature, La.**—Revue des sciences et de leurs applications aux arts et à l'industrie. Journal hebdomadaire illustré. Rédacteur en Chef **G. Tissandier.** xvii° année, 1889. 1er et 2e Semestres. 2 vols. sm. f°. Paris, s.a.

* **Nautical Magazine** for 1889. New series. A journal of papers on subjects connected with maritime affairs. Vol. lviii. 8°. London, s.a.

New York, American Geographical Society.—Journal. Vol. xxi., 1889. la. 8°. New York, s.a.

Nice, Société de Médecine et de Climatologie de Nice.—Nice-Médical. 13e Année, 1888-89, Nos. 1-12. la. 8°. Nice, 1888-89.

Nipher, F. E.—[Bulletin of the] Missouri Weather Service. 1889, Jan.—Dec. 4°.

‖ ——— Report on Missouri rainfall, with averages for ten years ending December, 1887. 8°. (*Trans. St. Louis Acad. Sc.*, v., 1889, *p.* 383.)

Oxford, Radcliffe Observatory.—Results of meteorological observations made at the Radcliffe Observatory, Oxford, in the year 1885, under the superintendence of **E. J. Stone.** Vol. xliii. la. 8°. Oxford, 1889.

Palermo, R. Osservatorio.—Bullettino della Sezione meteorologica a Valverde annessa alla società di acclimazione. Vols. i.-viii., 1880-87. 8 vols. 8°. s.l.e.a.

——— ——— **Stazione di Valverde.**—Osservazioni meteorologiche. Nuova seric. Anni v. e vi. 1884-85. 2 vols. sm. f°. Palermo, 1886, 1889.

Paris, Académie des Sciences.—Comptes-Rendus hebdomadaires des séances. . . . Tomes cviii.-cix., 1889. 2 vols. 4°. Paris, 1889.

——— **Bureau Central Météorologique de France.**—Annales . . . publiées par **E. Mascart.** Années 1885, ii.; 1886, ii.; 1887, i., ii., iii. 5 vols. la. 4°. Paris, 1888-89.

——— Bulletin international. xxxiiie. Année, 1889. Jan. 1—Dec. 31. 4°.

——— **Comité International des Poids et Mesures.**—Procès-verbaux des séances de 1888. 8°. Paris, 1889.

——— **Ministère de la Marine et des Colonies.**—Revue maritime et coloniale. Tomes ci.-ciii. 3 vols. la. 8°. Paris, 1889.

——— ——— Table alphabétique et analytique des matières contenues dans les 40 volumes de la Revue Maritime et Coloniale de 1879 à 1888. la. 8°. Paris, 1889.

——— **Observatoire Municipal de Montsouris.**—Annuaire . . . pour l'an 1889. 18°. Paris, s.a.

——— **Service Hydrométrique du Bassin de la Seine.**—Observations sur les cours d'eau et la pluie centralisées pendant l'année 1888 . . . 7 plates. f°. Versailles, s.a.

‖ ——— ——— Résumé des observations centralisées . . . pendant l'année 1888 . . . la. 8°. Versailles, 1889. (*Ann. soc. météor. Fr.*, xxxviii., 1890, *Janv.*)

——— **Société Météorologique de France.**—Annuaire. Tome xxxvi., 1888. la. 8°. Paris, s.a.

|| **Paulsen, A.**—Contribution à notre connaissance de l'aurore boréale. 8°. (*Bull. acad. R. Dan. Sc. Lettres*, 1889.)

Peek, C. E.—Meteorological observations for the year 1888. Rousdon Observatory, Devon. Vol. v. 4°. London, 1889.

Peking, Inspector General of Customs.—List of the Chinese lighthouses, light-vessels, buoys, and beacons for 1890. 18th issue. 4°. Shanghai, 1890.

——— Medical reports, for the half year ended 30th September 1887. 34th issue. 4°. Shanghai, 1890.

|| **Pernter, J. M.**—Die allgemeine Circulation der Atmosphäre. 1a. 8°. (*Monatsbl. Wissensch. Club, Wien*, 1889, *No.* 2.)

(Perpignan, Commission Météorologique Départementale des Pyrenées-Orientales.)—Bulletin météorologique annuel . . . par le Dr. **Fines.** Année 1888. 4°. Perpignan, 1889.

Petermann's (Dr. A.) Mitteilungen aus Justus Perthes' geographischer Anstalt. Herausgegeben von **A. Supan.** 35 Bd., 1889. 4°. Gotha, s.a.

——— aus Justus Perthes' geographischer Anstalt. Herausgegeben von **A. Supan.** Ergänzungsband xx., 1888–89. 4°. Gotha, 1889.

Philadelphia, American Philosophical Society.—Proceedings of the American Philosophical Society held at Philadelphia for promoting useful knowledge. Vol. xxvi. 1889. 1a. 8°. Philadelphia, 1889.

——— ——— Subject register of papers published in the Transactions and Proceedings of the Amer. Phil. Soc. Compiled by **H. Phillips.** 8°. Philadelphia 1889.

——— ——— Supplemental register of written communications published in the Transactions and Proceedings of the Amer. Phil. Soc., 1881–1889. Compiled by **H. Phillips.** 8°. Philadelphia, 1889.

——— **Franklin Institute.**—The journal of the Franklin Institute, devoted to science and the mechanic arts. Third series, vols. xcvii.–xcviii., 1889. 2 vols. 8°. Philadelphia, 1889.

* || **Plana, J. [G.]**—Mémoire sur la connexion existante entre la hauteur de l'atmosphère et la loi du décroissement de sa température. Lu . . . 1853. 1a. 4°. [*Mem. Accad. Torino, serie* ii., *Tom.* xv., 1855.]

* **Plumandon, J.-R., et Colomès, A.**—Tableau synoptique de la prévision du temps à l'usage de tout le monde. 1a. f°. s.l.e.a.

Pola, hydrographisches Amt der k. k. Kriegsmarine.—Meteorologische und magnetische Beobachtungen. 1889, Jan.—Dec., and Results. Oblong 1a. 8°.

——— **K. K. hydrographisches Amt.**—Mittheilungen aus dem Gebiete des Seewesens. Jahrg. 1889. xvii. Band. 1a. 8°. Pola, 1889.

Contains also some unnumbered pages of meteorological observations recorded at Pola during 1888–89.

|| **Port au Prince, Haiti.**—Tägliche meteorologische Beobachtungen im Jahre 1888, angestellt am Petit Seminaire Collège St. Martial. 1a. 4°. (*Jahrb. k. k. Central-Anst. Meteor., Wien*, 1888, *p.* 121.)

Porto Rico, Jefatura de Obras Públicas de la Isla de Puerto Rico.—Resúmen de las observaciones meteorológicas verificadas. 1889. Jan.—Dec. 8°. Sheets.

Pouchet, G.—Expériences sur les courants de l'Atlantique Nord, faites sous les auspices du Conseil Municipal de Paris. 4°. Paris, 1889.

Prague, Forstlehranstalt Weisswasser.—Ombrometrische Beobachtungen der vom böhmischen Forstvereine in den Forsten Böhmens in verschiedenen Seehöhen und Expositionen errichteten Stationen. Herausgegeben . . . von **E. von Purkyně** und **A. Peřina.** i.–iv. Jahrg., 1879–1882. 4 vols. 4°. Prag, s.a.

See also *Studnička, F. J.*

——— **königl-böhmische Gesellschaft der Wissenschaften.**—Abhandlungen der mathematisch-naturwissenschaftlichen Classe. vii. Folge, Bd. i.–ii. 1885–1888. 2 vols. 1a. 4°. Prag, 1886–88.

In the Czech language also.

Contains "Resultate d. ombrometrischen Beob. in Böhm. von F. J. Studnička. 1884–87."

——— **K. K. Sternwarte.**—Magnetische und meteorologische Beobachtungen . . . 1888. Auf öffentliche Kosten herausgegeben von **L. Weinek.** 49 Jahrg. 1a. 4°. Prag, s.a.

Prince, C. L.—The summary of a meteorological journal kept by C. L. Prince at his observatory, Crowborough, Sussex. 1888, 1889. 2 parts. sm. f°. s.l.e.a.

Puebla, Observatorio Meteorológico del Colegio del Estado de Puebla.—Resúmen correspondiente a cada dia. 1889, Jan.—Dec. sm. f°.

Purper, L.—Le principe du mouvement et son application à la mécanique céleste et à la météorologie. 4°. Paris, 1889.

|| **Ragona, D.**—Coefficienti per la temperatura e per la pressione atmosferica nel barometro registratore Richard. sm. f°. Modena, 1889. (*Mem. R. Accad. Sc. Lett. Art. Modena.*)

|| ——— Determinazione dei coefficienti per la temperatura e per la pressione atmosferica nel barometro registratore Richard. sm. f°. Torino, 1889. (*Boll. mens. Osserv. Moncalieri, Ser.* ii., ix.)

|| ——— Influenza della distanza de sole dal piano dell' equatore celeste sui periodi barometrici diurni. sm. f°. Torino, 1889. (*Boll. mens. Osserv. Moncalieri, Ser.* ii., ix.)

|| ——— Pressione atmosferica bi-oraria del 1888 e considerazioni sulle proprietà delle formule periodiche relative all' andamento diurno del barometro e sulle ore tropiche dei mesi invernali. la. 4°. Roma, 1889. (*Annal. Uff. Centr. Meteor. e Geodinam, Parte* i., *vol.* ix., 1887.)

|| ——— Pressione atmosferica ridotta al medio livello del mare in Modena. sm. f°. Modena, 1889. (*Mem. R. Accad. Sc. Lett. Art. Modena.*)

|| ——— Vero andamento diurno della umidità relativa. sm. f°. Roma, 1889. (*Ann. Uff. Centr. Meteor. e Geodinam.*, ix., 1887, *Parte* i.)

Rajna, M.—Confronti e verificazioni d'azimut assoluti in Milano con alcune notizie sulle antiche triangolazioni nei dintorni di questa città. Pubbl. R. Osserv. di Brera in Milano, No. xxxv. sm. f°. Milano, 1889.

[**Raulin, V.**]—[Distribution des pluies à la surface des Pyrénées en 1871–80.] 8°. (*Bull. soc. Ramond*, 1883, *p.* 321.)

Reuter, F.—Observations météorologiques faites à Luxembourg. 1874–83. 3e vol. la. 8°. Luxembourg, 1887.

Reuter-Chomé, F.—Observations météorologiques faites à Luxembourg. Moyennes de la période de 1854–1883. 4e vol. la. 8°. Luxembourg, 1887.

* **Richard Frères.**—Notice sur les instruments enregistreurs construits par Richard Frères comprenant le rapport de M. le Colonel Sébert à la Soc. d'Encouragement pour l'Industrie nationale et l'exposé des perfectionnements et applications nouvelles. 3me éd. 4°. Paris, 1889.

|| **Riggenbach, A.**—Die unperiodischen Witterungserscheinungen auf Grund 111 jähriger Aufzeichnungen der Niederschlagstage. 8°. Basel, 1890. (*Verhandl. Naturf. Gesellsch. Basel*, ix., *Heft* 1, *p.* 63.)

|| ——— Resultate aus 112 jährigen Gewitteraufzeichnungen in Basel. 8°. Basel, 1889. (*Verhandl. Naturf. Gesellsch. Basel*, viii., *p.* 802.)

Riposto, Osservatorio Meteorologico del R. Istituto Nautico.—Bollettino mensile. Anno xv., 1889. Fasc. 1–12. sm. f°. Riposto, 1889.

Rome, Ufficio Centrale Meteorologico e Geodinamico Italiano.—Annali. Serie ii. Vol. vii., 1885, Parte 1–3; viii., 1886. Parte i.–iv. 7 vols. sm. f°. Roma, 1887–89.

——— ——— Bollettino meteorico. Anno xi., 1889, Jan. 1—Dec. 31. la. 4°. Sheets.

——— ——— Rivista Meteorico-Agraria. Anno x., 1889, Nos. 1–36. la. 8°. (Roma, 1889–90.)

Rugby School Natural History Society.—Report . . . for the year 1889. 8°. Rugby, 1890.

|| **Russell, H. C.**—Astronomical and meteorological workers in New South Wales, 1778 to 1860. 8°. (*Proc. Austral. Assoc. advanc. sc., Sydney*, 1888, *p.* 45.)

|| ——— On a new self-recording thermometer. Read before the R. Soc. of N.S.W., 7 Nov. 1888. 8°. [*Journ. R. Soc., N.S.W.*]

|| ——— Proposed method of recording variations in the direction of the vertical. 8°. (*Proc. Austral. assoc. advanc. sc., Sydney*, 1888, *p.* 106.)

|| ——— The source of the underground water in the Western districts. 8°. [*Journ. R. Soc., N.S.W.*, 1889.]

|| **Russell, H. C.**—The storm of 21st September 1888. Read before the R. Soc. of N.S.W., Oct. 3, 1888. 8°. [*Journ. R. Soc., N.S.W.*]

|| ——— The thunderstorm of 26th October, 1888. Read before the R. Soc. of N.S.W., Nov. 7, 1888. 8°. [*Journ R. Soc., N.S.W.*]

|| ——— **W. J.**—On the amount of carbonic acid in London air. la. 4°. (*Monthl. Weather Rep., London*, 1884, *Apl., App.* ii.)

|| ——— On London rain. la. 4°. (*Monthl. Weather Rep., London*, 1884, *Apl., App.* i.)

Russia.—Karta Evropeĭskoĭ Rossii. Snyeghovoĭ pokrov poleĭ k nachalu Fevralya 1890. Prilozhenie k N°. 10 "Vyestnika Finaisov." Map of Russia in Europe showing surface covered by snow in beginning of Feb. 1890. App. No. 10 to "Messenger of Finance." f°. Sheet.

St. Petersburg, Kaiserliche Akademie der Wissenschaften.—Repertorium für Meteorologie. . . . . Redigirt von **H. Wild.** Bd. xii. sm. f°. (St. Petersburg), 1889.

Title page in Russian language also.

——— **physikalisches Central-Observatorium.**—Annalen . . . herausgegeben von **H. Wild.** Jahrg. 1888. Theil i. und ii. 2 vols. sm. f°. St. Petersburg, 1889.

——— ——— Jahresbericht . . . für 1887 und 1888. Der Akademie abgestattet von **H. Wild.** sm. f°. St. Petersburg, 1889.

——— ——— Meteorologisches Bulletin. 1889, Jan. 1—Dec. 31. f°. Sheets.

In the Russian language also.

From May 12, 1889, the secondary title is in French :—Bulletin météorologique de l'Observatoire Physique Central.

[——— **Scientific Department of the Naval Technical Committee.** Naval Repertory. 1889, Nos. 1–12. Vols. ccxxix.–ccxxxiv. 6 vols. la. 8°. St. Petersburg, 1889.]

In the Russian language.

Samoa.—Report of the hurricane on the 16th March, 1889.

See "*Calliope*," *H.M.S.*

San Fernando, Instituto y Observatorio de Marina.—Anales . . . publicados . . . por el Director Don **C. Pujazon.** Seccion 2ª. Observaciones meteorológicas. Año 1888. f°. San Fernando, 1889.

San José de Costa Rica, Instituto Meteorológico Nacional.—Boletin trimestral . . . publicado bajo la dirección del **E. Pittier.** Tomo i., 1888. f°. San José, 1889.

Schiaparelli, G. V.—Sulla distribuzione apparente delle stelle visibili ad occhio nudo. Pubbl. R. Osserv. Brera in Milano, N. xxxiv. sm. f°. Milano, 1889.

Schönrock, A.—Zusammenfassung der Resultate wiederholter Vergleichungen der Normalbarometer in Europa. la. 4°. (St. Petersburg), 1889. (*Repert. Meteor.*, xiii., *No.* 1.)

|| **Schreiber, P.**—Die Theilnahme Sachsens an den meteorologischen Forschungen. la. 8°. (*Gesellsch. Isis Dresden*, 1889, *Abth.* 2.)

——— Ergebniss einiger Versuche über die specifische Schneetiefe. sm. f°. (*Meteor. Zeitschr.*, 1889, *Apl., p.* 141.)

|| ——— Neuerungen und Erfahrungen an Apparaten zur Prüfung von Thermometern und Aneroidbarometern, Windfahne und Windstärkemesser, Registrirapparaten von Richard frères und dem Barometer Wild-Fuess. la. 8°. (*Zeitschr. Instrumentenk.*, ix., 1889, *p.* 157.)

|| ——— Ueber einen registrirenden Regenmesser. la. 8°. (*Zeitschr. Instrumentenk., Jahrg.* ix., 1889, *p.* 143.)

——— [**P.**]—Ueber das Lamont'sche Verfahren zur Ableitung der täglichen Periode aus stündlichen Beobachtungen. sm. f°. (*Meteor. Zeitschr.*, 1889, *Dez., p.* 468.)

|| **Schuster, —.**—Observations météorologiques faites à Metz pendant l'année 1885. 3me série, xiveannée 8°. Metz, 1889. (*Mém. Acad. Metz.*)

|| **Scott, R. H.**—The climate of British North Borneo. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xv., 1889, *p.* 206.)

* ——— Weather forecasting. 8°. (*Murray's Mag.*, vii., 1890, *Mch., p.* 343.)

Seeland, F.—Magnetische und meteorologische Beobachtungen zu Klagenfurt. Dec. 1888—Nov. 1889 and year. 8°. s.l.e.a.

* **Sheepshanks, Rev. R.**—Correspondence respecting the Liverpool Observatory, between Mr. John Taylor and the Rev. R. Sheepshanks. With supplement. 8°. London, 1845.

* ——— A reply to Mr. Babbage's letter to "The Times," "on the planet Neptune and the Royal Astronomical Society's medal." 8°. London, 1847.

* ——— A letter to the Board of Visitors of the Greenwich Royal Observatory in reply to the calumnies of Mr. Babbage at their meeting in June 1853, and in his book entitled The Exposition of 1851. With correspondence prefixed. 8°. London, 1860.

*|| ——— On the construction of standard thermometers. 8°. London, 1852. (*Monthly Not. R. Astr. Soc.*)

*|| ——— Memoir of the late. 8°. London, 1856. (*Monthly Not. R. Astr. Soc.*, xvi., *No.* 4.)

(Singapore, Principal Civil Medical Officer, Straits Settlements.)—Meteorological report, Straits Settlements, for the year 1888. sm. f°. s.l.e.a.

|| **Singer, K.**—Die Bodentemperaturen an der K. Sternwarte bei München und der Zusammenhang ihrer Schwankungen mit den Witterungsverhältnissen. sm. f°. München, 1890. (*Beob. meteor. Stat. K. Bayern.*, xi., 1889.)

|| **Sorel, G.**—La pression du vent d'après les anémomètres de Robinson et de Bourdon. 4°. (*Bull. météor. Pyr.-Orient.*, xvii., 1888.)

|| ——— Sur le calcul de la pression du vent. 4°. (*Bull. météor. Pyr.-Orient.*, xvii., 1888.)

South Australia.—Report on telegraphic determination of Australian longitudes. Ordered by the House of Assembly to be printed, Nov. 17th, 1886. f°. s.l.e.a.

* **Steel, R.**—The New Hebrides and Christian Missions. sm. 8°. London, 1880.

Stewart, C. H.—Note on the carbonic acid and micro-organisms in the air at various stations during the cruise of H.M.S. "Jackal." la. 8°. (*7th Ann. Rep. Fish. Board Scotland*, 1888, *part* iii., *p.* 472.)

Stockholm, Kongl. Svenska Vetenskaps-Akademie.—Meteorologiska Iakttagelser i Sverige . . . anstälda och utarbetade under inseende af meteorologiska Central-Anstalten. xxvi. Bd. 2dra serien, Bd. 12. 1884. la. 4°. Stockholm, 1889.

In the French language also.

——— **Meteorologiska Central-Anstalt.**—Månadsöfversigt af väderleken i Sverige till landtbrukets tjenst utgifven under meteorologiska Central-Anstaltens inseende af Dr. **H. E. Hamberg.** Årgång. ix. 1889. f°. Stockholm, 1890.

Stokes, J.—Meteorological observations at Margate.
See *Margate, Medical Officer of Health.*

*|| **Stoney, G. J.**—On the cause of iridescence in clouds. 4°. Dublin, 1887. (*Sc. Trans. R. Dubl. Soc., N.S.*, iii., *p.* 637.)

Stonyhurst College Observatory.—Results of meteorological, magnetical, and solar observations. By the Rev. **S. J. Perry.** 1888. sm. 8°. Market Weighton, 1889.

The Appendix contains "Results of meteor. obsns. taken at St. Ignatius' College, Malta, by the Rev. J. Scoles. 1888."

|| **Studnička, F. J.**—Grundzüge einer Hyëtographie des Königreiches Böhmen. Nach mehrjährigen Beobachtungsergebnissen von 700 ombrometrischen Stationen. la. 8°. Prag, 1887. (*Archiv. naturw. Landesdurchf. Böhm.*, vi., *Nro.* 3.)

|| ——— Resultate der ombrometrischen Beobachtungen in Böhmen. 1879–1883. 5 vols. la. 4°. Prag, 1880–84. (*Abhandl. k. böhm. Gesellsch. Wissensch., Folge* vi., *Bd.* 10, 11, 12.)

In the Czech language also.

For continuation see *Prague, Abhandl. k. böhm. Gesellsch. Wissensch., Folge* vii.

Stuttgart, Königl. statistisches Landesamt.—Mitteilungen. 1889. Nos. 1–12. la. 8°. Stuggart, 1889–90.

Stuttgart, Meteorologische Centralstation.—Deutsches meteorologisches Jahrbuch. Jahrg. 1888. Württemberg. Mitteilungen der mit dem königl. statistischen Landesamt verbundenen meteorologischen Centralstation. Bearbeitet von **L. Meyer.** la. 4°. Stuttgart, 1889.

Sundell, A. F.—Åskvädren i Finland 1888. 8°. Helsingfors, 1889.

[Sydney Observatory.]—Results of meteorological observations made in New South Wales during 1887, under the direction of **H. C. Russell.** la. 8°. Sydney, 1889.

[——— ———] Results of rain, river, and evaporation observations made in New South Wales, during 1888. By **H. C. Russell.** la. 8°. Sydney, 1889.

——— ——— Weather chart of Australia and New Zealand. 1889, Jan. 1—Dec. 31. f°. Sheets.

——— **Royal Society of New South Wales.**—Catalogue of the scientific books in the library. Part i. General catalogue. 8°. Sydney, 1889.

——— ——— Journal and proceedings . . . . for 1888. Vol. xxii. 8°. Sydney, 1889.

Symons, G. J.—British rainfall, 1888. On the distribution of rain over the British Isles, during the year 1888 . . . 8°. London, 1889.

Symons's Monthly Meteorological Magazine.—Vol. xxiv., 1889. 8°. London, 1890.

Syracuse, Osservatorio Centrale di Siracusa.—Osservazioni meteorologiche fatte nell' osservatorio centrale di Siracusa e nelle stazioni della rete meteorico-agraria della provincia. Anno xiii., 1889, Jan.-Dec. 8°. Siracusa, 1889.

Tacubaya, Observatorio Astronómico Nacional.—Anuario. 1890. Formado bajo la dirección del Ingeniero **A. Anguiano.** Año x. sm. 8°. México, 1889.

Taylor, A. S.—A thermometrical table, on the scales of Fahrenheit, Centigrade, and Reaumur, comprising the most remarkable phenomena, chemical and physiological, connected with temperature. la. f°. Sheet. London, 1845.

‖ **Tebbutt, J.**—On the high tides of June 15th–17th [1889]. 8°. [*Journ. Proc. R. Soc. N.S.W.*, 1889.]

——— Report of Mr. Tebbutt's observatory, Windsor, New South Wales, for the year 1888. 8°. Sydney, 1889.

* "**The Times**" register of events in 1889. 8°. London, 1890.

Tiflis, physikalisches Observatorium.—Meteorologische Beobachtungen . . . in den Jahren 1887–1888. Herausgegeben von **J. Mielberg.** la. 8°. Tiflis, 1888.

In the Russian language also.

Tokio, Imperial Meteorological Observatory.—Report of the meteorological observations in the Empire of Japan. 1884–1885. 2 vols. la. 8°. s.l.e.a.

In the Japanese language also.

——— **Meteorological Central Observatory.**—Annual meteorological report. 1886–1887, Parts i. and ii. 4 vols. la. 8°. s.l.e.a.

In the Japanese language also.

——— ——— Tridaily weather maps, reports, remarks and indications. 1888–Jan.—Dec. 4°.

Toronto, Bureau of Industries for the Province of Ontario.—Annual Report. 1888. Parts i.–iii. 1 vol. la. 8°. Toronto, 1889. (*Sessional Papers*, xxi., 1889, *Part* ix., *No.* 74.)

——— **Magnetical Observatory.**—General meteorological register for the year 1888. 8°. s.l.e.a.

——— **Meteorological Service, Dominion of Canada.**—Monthly weather review. 1889, Jan.—Dec. la. 4°. s.l.e.a.

——— ——— Report . . . by **C. Carpmael.** For the year ending December 31, 1886. la. 8°. Ottawa, 1889.

Trieste, I. R. Accademia di Commercio e Nautica.—Osservazioni meteorologiche instituite all' Osservatorio Marittimo. 1889, Jan.—Dec., and Results. oblong la. 8°. Sheets.

Trieste, Osservatorio Marittimo.—Rapporto annuale . . . contenente le osservazioni meteorologiche, mareografiche e fenologiche di Trieste e le osservazioni meteorologiche di alcune altre stazioni Adriatiche per l'anno 1886, redatto da **F. Osnaghi.** Vol. iii. la. 4°. Trieste, 1889.

Trinidad, Botanical Department.—Island rainfall, 1868–1888. Compiled by **J. H. Hart.** oblong sm. 8°. Port-of-Spain, 1889.

——— **Botanic Gardens.**—Meteorological results as taken at the Botanic Gardens, Trinidad, for 1886. With annual rainfall, 1862 to 1886, inclusive. sm. f°. Sheet.

——— **Royal Botanic Gardens.**—Annual report on the Royal Botanic Gardens and their work for 1888. sm. f°. Port-of-Spain, 1889.

‖ **Tripp, W. B.**—South American rainfall south of the tropics. la. 8°. (*Scott. Geogr. Mag.* 1889, *June.*)

Tucuman, Oficina Química.—Boletin. Tomo i., 1888. la. 8°. Tucuman, 1888.

Turin, Società Meteorologica Italiana.—Annuario meteorologico italiano. Anno v. 1890. sm. 8°. Torino, 1890.

——— Bollettino mensuale pubblicato per cura dell' Osservatorio centrale del Real Collegio Carlo Alberto in Moncalieri. Serie ii., vols. viii.-ix. (della intera Collezione Vols. xxiii.-xxiv.) 1888–89. sm. f°. Torino, 1888–89.

United States.—Report for the year 1888 on the agriculture of the Consular district of San Francisco. Diplomatic and Consular Reports on trade and finance. Foreign Office, No. 546. la. 8°. London, 1889.

Contains some notes on meteorology of Oregon.

Upsala, Observatoire Météorologique de l'Université.—Bulletin mensue.. Vol. xx. 1888. Par **H. H. Hildebrandsson.** la. 4°. Upsal, 1888–89.

Utrecht, Koninklijk Nederlandsch Meteorologisch Instituut.—Barometerstanden en Winden in de Golf van Aden en den Indischen Oceaan bij Kaap Guardafui. oblong la. 8°. Utrecht, 1889.

——— ——— Nederlandsch meteorologisch jaarboek. 1879, ii.; 1888. 2 vols. oblong 8°. Utrecht, 1889.

——— ——— Reizen door de Chinesche Zee en het Westelijk Gedeelte van den Noord Pacific, en onderzoekingen aangaande winden, zeestroomingen, enz. I. Deel, ii. vermeerderde druk. II. Deel. 2 vols. la. 4°. Utrecht, 1879, 1876.

[——— ———] Uur van stroom-kentering, waargenomen aan boord van het Lichtschip op den N. Hinderbank. 4°. Sheet.

——— ——— Waarnemingen in den Indischen Oceaan over de maanden December, Januari en Februari. oblong f°. Utrecht, 1889.

——— ——— Waarnemingen van onweders in Nederland. 1882–88. 7 vols. la. 8°. Utrecht, 1882–86. Amsterdam, 1887–89.

Vaughan, J. D. W.—Meteorological observations at Levuka and Suva, Fiji. 1875 to 1885.

See *London, Colonial and Indian Exhibition*, 1886. *Handbook of Fiji.*

Vienna, K. K. Central-Anstalt für Meteorologie und Erdmagnetismus.—Beobachtungen. 1889, Jan.—Dec., and Results. 8°.

——— **K. K. Central-Anstalt für Meteorologie.**—Telegrafischer Wetterbericht. Jahrg. xiii., 1889. Jan. 1—Dec. 31. la. 4°. Sheets.

——— **Kais. Königl. geographische Gesellschaft in Wien.**—Mittheilungen. 1888. Redigirt von . . . **F. Ritter von Le Monnier.** xxxi. Bd. (der neuen Folge xxi.) la. 8°. Wien, 1888.

‖ ——— **K. K. Sternwarte.**—Meteorologische Beobachtungen auf der K. K. Sternwarte in den Jahren 1885 und 1886. la. 4°. Wien, 1888. (*Ann. Wien Sternwarte, Bd.* vi.)

(Volante, G.)—Osservazioni meteorologiche fatte in Alessandria alla Specola del Seminario. 1887, 1888. Anni xxx.-xxxi. 2 vols. 8°. Alessandria, 1889.

(Waldo, F.)—A review of some important tornado literature. la. 8°. (*Amer. meteor. journ.*, vi., 1889, *p.* 66.)

Washington, Hydrographic Office.—Pilot charts of the North Atlantic Ocean. 1889, Jan.—Dec. 12 charts, la. f°.

Washington, Hydrographic Office.—Report of ice and ice movements in Bering Sea and the Arctic basin, by **E. Simpson**, under the direction of **C. H. Stockton**, commanding U.S.S. "Thetis." 8°. Washington, 1890.

——— **Signal Office.**—Annual report of the Chief Signal Officer of the Army to the Secretary of War for the year 1888. la. 8°. Washington, 1888.

——— ——— Bibliography of meteorology. A classed catalogue of the printed literature of meteorology from the origin of printing to the close of 1881; with a supplement to the close of 1887, and an author index. Prepared under the direction of **A. W. Greely**. Edited by **O. L. Fassig**. Part i. Temperature. Part ii. Moisture. 2 vols. 4°. Washington, 1889.

——— ——— Monthly weather review. 1889, Jan.—Dec. and Suppl. 4°. Washington, 1889–90.

——— ——— War Department weather map. 1889, Jan. 1.—Dec. 31. la. f°. Sheets.

——— **Smithsonian Institution.**—Annual report of the Board of Regents . . . for the year ending June 30, 1886. Part i. 8°. Washington, 1889.

‖ ——— **Surgeon-General's Office.**—List of books and articles on climatology and meteorology in the Library of the Surgeon-General's Office, U.S.A. sm. f°. Washington, 1888. [*Extracts from the Index Catalogue Surg. Gen. Office.*]

* ——— **United States Coast and Geodetic Survey.**—Methods and results. The currents and temperatures of Bering Sea. (By **W. H. Dall.**) App. No. 16.—Report for 1880. la. 4°. Washington, 1882.

* (——— **War Department.**)—Letter from the Secretary of War, transmitting letter of the Chief Signal Officer, on the rain-fall of the Pacific Slope and the Western States and Territories. la. 4°. Washington, 1888.

‖ **Weber, L.**—Mittheilungen, betreffend die im Auftrage des elektrotechnischen Vereins ausgeführten Untersuchungen über atmosphärische Elektrizität. Dritter Bericht. la. 8°. (*Elektrotechn. Zeitschr.*, x., 1889, *Aug.*)

‖ ——— Über Blitzphotographien. la. 8°. (*Sitzungsb. k. Preuss. Akad. Wissensch. Berlin*, xxxviii., 1889, *p.* 781.)

(Weihrauch, K.)—Bericht über die Ergebnisse der Beobachtungen an den Regenstationen der kaiserlichen livländischen gemeinnützigen und ökonomischen Societät für das Jahr 1887. la. 4°. Dorpat, 1889.

Wellington, Colonial Museum and Geological Survey.—Meteorological report, 1885: including returns for 1883 and 1884, and averages for previous years. (Preface by **J. Hector.**) la. 8°. Wellington, s.a.

* **Weyher, C. L.**—Sur les tourbillons, trombes, tempêtes et sphères tournantes. Étude et expériences. 2e éd., revue et augmentée. la. 8°. Paris, 1889.

Whipple, G. M.—Photography in relation to meteorological work. la. 8°. (*Journ. Trans. Photogr. Soc. Gt. Brit.*, xiv., *N.S.*, 1889, *No.* 3, *p.* 16.)

* **White, W. H.**—A series of letters on weather changes and their approximate causes, reviewing the various weather theories. Letters by **R.**, published in the "Scottish Farmer and Horticulturist," on Admiral FitzRoy and his system of forecasts. Letter by **Mercurius**, on weather predictions, and Letter by **F. Pratt** on the astronomic law of storms. Published for private circulation. sm. 8°. Glasgow, 1865.

‖ **Wild, H.**—Neue Form magnetischer Variationsinstrumente und zugehörender photographischer Registrir-Apparate mit Scalenablesung. la. 4°. St. Pétersbourg, 1889. (*Mém. acad. imp. sc. St. Pétersb.*, vii. *série, Tome* xxxvii., *No.* 4.)

‖ ——— Normaler Gang und Störungen der erdmagnetischen Declination. sm. f°. St. Petersburg, 1889. (*Mél. phys. chim.*, xiii., *Livr.* 1, *p.* 49.)

‖ ——— Uber Assmann's neue Methode zur Ermittlung der wahren Lufttemperatur. la. 4°. (*Repert. Meteor.*, xii., *No.* 11.)

‖ ——— **et Backlund, O.**—Rapport fait à l'académie impériale des sciences par les délégués de la Russie à la conférence générale du mètre, réunie à Paris en septembre 1889. la. 8°. (*Mél. phys. chim. St. Pétersb.*, xiii., *p.* 123.)

* **Wilson, G.**—The life of the Honble. Henry Cavendish, including abstracts of his more important scientific papers, and a critical enquiry into the claims of all the alleged discoverers of the composition of water. 8°. London, 1851.

Woeikof, A.—Der Einfluss einer Schneedecke auf Boden, Klima und Wetter. la. 8°. Wien und Olmütz, 1889. (*Geogr. Abhandl. von A. Penck, Wien, Bd.* iii., *Heft* 3, *p.* 321.)

|| ——— Voyage aux salines d'Iletsk et au pays voisin. 8°. (*Compt. rend. soc. géogr. Paris*, 1888, *Nos.* 16 *et* 17.)

|| **Wollny, E.**—Entgegnung, veranlasst durch die Abhandlung des Herrn C. Lang. Welche Zuverlässigkeit besitzt die abendliche Thaupunkts-bestimmung als Anhaltspunkt für Stellung der Nachtfrostprognose? Beob. meteor. Stationen K. Bayern, x., 1888. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg, Bd.* xii., *Heft* 1 *u* 2.)

|| ——— Zur Frage der Brauchbarkeit der Thaupunktmethode zur Vorausbestimmung der Nachtfröste. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg, Bd.* xii., *Heft* 3 *u* 4.)

|| ——— Untersuchungen über das Verhalten der atmosphärischen Niederschläge zur Pflanze und zum Boden. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg,* xii. *Bd., Heft* 5.)

|| ——— Untersuchungen über den Einfluss der Farbe des Bodens auf dessen Feuchtigkeitsverhältnisse und Kohlensäuregehalt. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg,* xii. *Bd., Heft* 5.)

|| ——— Untersuchungen über den Einfluss der Pflanzendecke und der Beschattung auf die physikalischen Eigenschaften des Bodens. Dritte Mittheil. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg, Bd.* xii., *Heft* 1 *u* 2.)

York, Yorkshire Philosophical Society.—Annual report of the Council . . . for 1888. la. 8°. York, 1889.

* **Zenker, W.**—Die Vertheilung der Wärme auf der Erdoberfläche. la. 8°. Berlin, 1888.

Zi-ka-wei, Observatoire Magnétique et Météorologique. — Bulletin mensuel. Tome xiv., année 1888. sm. f°. Zi-ka-wei, 1889.

Zürich.—Bericht über die Verhandlungen des internationalen meteorologischen Comités. Versammlung in Zürich im September, 1888. Mit einem Vorwort über die Entwickelung der meteorologischen Forschung in Deutschland und einem Sachregister der verschiedenen Berichte des internationalen Comités seit dem meteorologen Kongresse in Rom. Herausgegeben von Dr. **Neumayer.** la. 8°. Hamburg, 1889.

——— Rapport du comité météorologique international. Réunion de Zurich, 1888. Publié par le **Bureau Central Météorologique de France.** la. 8°. Paris, 1889.

——— Report of the fourth meeting of the international meteorological Committee. Zürich, September, 1888. Published by authority of the **Meteorological Council.** la. 8°. London, 1889.

——— **Schweiz. Departement des Innern.**—Graphische Darstellung der schweizerischen hydrometrischen Beobachtungen. 1889. la. f°. Sheets.
For the second half of the year the title is in French.

——— **Schweizerische meteorologische Central-Anstalt.**—Wetterbericht, 1889, Jan. 1—Dec. 31. sm. f°. Sheets.

APPENDIX XIX.

METEOROLOGICAL OFFICE: ACCOUNT of RECEIPTS and PAYMENTS for the year ending 31st March 1890.

RECEIPTS.	£ s. d.	£ s. d.	PAYMENTS.	£ s. d.	£ s. d.
Balance from year 1888–89		3,468 12 9	ADMINISTRATION:		
Parliamentary Vote		15,300 0 0	Payment of Council	955 18 4	
Repayment of expenses charged under—			Secretary	800 0 0	
(1.) Incidental expenses	7 9 0		Salaries and wages	801 4 2	
(2.) Special researches	4 11 8		Rent, fuel, and lighting	714 11 3	
(3.) Observatories	8 19 6		Incidental and contingent expenses:—		
		21 0 2	Attendance, cleaning, &c.	350 8 0	
SUPPLY OF INFORMATION:			Furniture and fittings	154 13 10	
D.W. Charts and Forecasts	247 13 9		Expenses incidental to International Meteorological Congress	5 2 0	
6 p.m. Charts	25 0 0		Pensions	186 16 4	
Information for Press Agencies, &c.	105 19 10				3,968 13 11
Telegrams	99 7 1		SPECIAL RESEARCHES	- - -	678 6 6
		478 0 8	LAND METEOROLOGY:		
SALE OF INSTRUMENTS, &c.:			Observatories and stations	1,954 8 1	
Royal Navy (A)	5 0 1		Salaries: —Discussion and reduction of observations	1,481 11 0	3,435 19 1
Mercantile Marine account (B)	66 13 4		WEATHER INFORMATION AND FORECASTS:		
		71 13 5	Telegraphic reports and storm warnings	2,548 4 4	
Commissions executed for Colonial and Foreign Institutions, &c. (C)		512 18 8	Salaries: — Preparation and issue of reports and forecasts	1,787 17 7	4,336 1 11
Commission charged on work done for Colonies, &c.		28 1 0	INSPECTIONS:		
			Salaries and travelling expenses	- - -	764 2 5
			OCEAN METEOROLOGY:		
			Salaries:—Discussion and reduction of observations	1,587 16 0	
			Expenses incidental to the supply of instruments:—		
			Proportion for care and issue of instruments	200 0 0	
			Royal Navy	525 15 1	
			Mercantile Marine	361 16 3	
			Distant island and coast stations	6 18 1	2,682 5 5
			Commissions executed for Colonial and Foreign Institutions, &c.	- - -	598 10 9
			BALANCE:		
			Cash at Bank	3,333 17 4	
			„ at Office	82 9 4	3,416 6 8
	£	19,880 6 8		£	19,880 6 8

In the year 1889–90 the sum of 1,606*l.* 9*s.* 5*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, and rental of private wires.

APPENDIX XX.

LIST OF PUBLICATIONS, &c. issued under the Authority of the Meteorological Council.

OFFICIAL.

No. 1 Report for 1867. Presented to Parliament. 1*s.*
2. Instructions for Meteorological Telegraphy. [Out of Print.]
3. Fishery Barometer Manual. (New edition, 1887.) 6*d.*
4. Charts of Surface Temperature, South Atlantic Ocean. 2*s.* 6*d.*
5. Report for 1868. Presented to Parliament. 5*d.*
6. Report for 1869. Presented to Parliament. 10*d.*
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5*s.* each.
8. Barometer Manual. (Out of print, see Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5*s.* each.
10. Report for 1870. Presented to Parliament. 10*d.*
*11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2*s.* 6*d.*
*12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2*s.* 6*d.*
13. A Discussion of the Meteorology of the Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. Price, with Book of Charts, 5*s.*
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s.* each.
15. Report for 1871. Presented to Parliament. 10*d.*
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5*s.* each.
17. Report for 1872. Presented to Parliament. 1*s.*
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2*s.*
19. Quarterly Weather Report, 1873.—Parts I. to IV. 5*s.* each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20° — 30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20*s.*
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1873. 1*s.*
22. Report for 1873. Presented to Parliament. 4*d.*
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2*s.*
24. Instructions in the Use of Meteorological Instruments. [Reprinted 1888.] 2*s.* 6*d.*
25. Quarterly Weather Report for 1874.—Parts I., II., and IV. 5*s.* each. Part III., 5*s.* 9*d.*
26. Report for 1874. Presented to Parliament. 6*d.*

* The Meteorological Council have given away the copies which were placed at their disposal, but the work can be purchased from the Publishers.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. 24*s*.

28. Contributions to our Knowledge of the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger*. 1*s*.

29. Report for 1875. Presented to Parliament. 4*d*.

30. Quarterly Weather Report for 1875.—Parts I.—IV. 5*s*. each.

31. Report for 1876–7. Presented to Parliament. 3*s*. 5*d*.

*32. A Discussion of the Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. 15*s*.

33. Quarterly Weather Report for 1876 (New Series).—Part I., 6*s*.; Parts II., III., and IV., 5*s*. each.

*34. Contributions to our Knowledge of the Meteorology of the Arctic Regions. Vol. I.,—Part I., 2*s*.; Part II., 10*s*.; Part III., 6*s*.; Part IV., 5*s*.; Part V., 6*s*.

35. Report for 1877–8. Presented to Parliament. 1*s*.

36. Report of the Proceedings of the Meteorological Congress at Rome, 1879. 1*s*. 6*d*.

37. Report on the Meteorology of Kerguelen Island. By the Rev. S. J. Perry, S.J., F.R.S. 3*s*.

38. Report for 1878–9. Presented to Parliament. 5*d*.

39. Meteorological Observations at Stations of the Second Order for the year 1878. 20*s*.

40. Aids to the Study and Forecast of Weather, by the Rev. W. Clement Ley, M.A. 1*s*.

41. Report for 1879–80. Presented to Parliament. 1*s*.

42. Report for 1880–81. Presented to Parliament. 1*s*. 2*d*.

43. Charts of Meteorological Data for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Price of the Charts, 25*s*.; of the Remarks, 7*s*.

44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E., by Capt. H. Toynbee. 7*s*. 6*d*.

45. Meteorological Observations at Stations of the Second Order for the year 1879. 20*s*.

46. Report on the Storm of October 13–14, 1881. By Robert H. Scott, F.R.S. 1*s*. 6*d*.

47. Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. 7*s*. 6*d*.

48. Report for 1881–2. Presented to Parliament. 1*s*.

49. Quarterly Weather Report for 1879. (New Series.) Appendices and Plates. 27*s*. Parts I., II., and III., 6*s*. each. Part IV., 5*s*. 6*d*.

50. Quarterly Weather Report for 1880. (New Series.) Appendices and Plates. 28*s*. Parts I. and II., 6*s*. each. Part III. (In the Press.)

51. Hourly Readings, 1881. (New Series.) Part I., 10*s*. 6*d*. Parts II., III., and IV., 21*s*. each.

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* The Meteorological Council have given away the copies which were placed at their disposal, but the work can be purchased from the Publishers.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 52. Quarterly Weather Report for 1877. (New Series.) Appendices and Plates. 27*s.*; Part I., 10*s.*; Part II., 5*s.* Part III., 4*s.* 6*d.*; Part IV., 6*s.*

53. Meteorological Atlas of the British Isles. 5*s.* 6*d.*

54. Hourly Readings, 1882. Parts I. and II., 20*s.* each. Part III., 22*s.* 6*d.* Part IV., 26*s.*

55. Quarterly Weather Report for 1878. (New Series.) Appendices and Plates. 28*s.*; Parts I., II., III., and IV., 6*s.* each.

56. Sunshine Records of the United Kingdom for 1881. 4*s.*

57. Meteorological Observations at Stations of the Second Order for the year 1880. 34*s.* 6*d.*

58. Report for 1882–3. Presented to Parliament. 10½*d.*

59. Sea Temperature Charts for the Atlantic, Pacific, and Indian Oceans. 21*s.*

60. Principles of Weather Forecasting. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition), 2*s.*

61. A Barometer Manual for the Use of Seamen. 1*s.* 3*d.*

62. Monthly Weather Reports for 1884. Jan., Feb., March, May —Nov., 1*s.* 6*d.* each. April (with 2 Appendices), 2*s.* 6*d.* Dec., 1*s.* 9*d.*

63. Hourly Readings, 1883. Parts I., II., and III., 21*s.* each. Part IV., 30*s.*

64. Report for 1883–4. Presented to Parliament. 1*s.* 2*d.*

65. Monthly Weather Reports for 1885. Jan. to Dec. 1*s.* 6*d.* each.

66. Meteorological Observations at Stations of the Second Order for the year 1881. 35*s.*

67. Report for 1884–5. Presented to Parliament. 4*s.* 4*d.*

68. Monthly Weather Reports for 1886. Jan. to Dec., 1*s.* 6*d.* each.

69. Meteorological Observations at Stations of the Second Order for the year 1882. 35*s.*

70. Hourly Readings, 1884. Part I., 12*s.*; Part II., 10*s.*; Part III., 10*s.* 6*d.*; Part IV., 15*s.*

71. Synchronous Weather Charts of the North Atlantic and the adjacent Continents. Aug. 1, 1882 to Sept. 3, 1883. Parts I. to IV. (33 sheets each.) 17*s.* each.

72. Report for 1885–86. Presented to Parliament. 8*d.*

73. Meteorological Observations at Stations of the Second Order for the year 1883. 30*s.*

74. Hourly Readings, 1885. Parts I. and II., 11*s.* each. Part III., 10*s.* 6*d.*; Part IV., 12*s.*

75. Report for 1886–87. Presented to Parliament. 8*d.*

76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10*s.* 6*d.* Supplemental Chart, 6*d.*

77. Monthly Weather Reports for 1887. January to August, 1*s.* 6*d.* each. September to December. (In the Press.)

78. Meteorological Observations at Stations of the Second Order for the year 1884. 32*s.*

79. Report for 1887–88. Presented to Parliament. 1*s.*

80. Daily Weather Charts of the Arabian Sea for the period of six weeks ending June 25, 1885 (The Aden Cyclone). (In the Press.)

LIST OF PUBLICATIONS, &c.—*continued.*

No. 81. Hourly Readings. 1886. Parts I., II., and III. 10*s.* 6*d.* each. Part IV. 12*s.* 6*d.*

82. Meteorological Observations at Stations of the Second Order for the year 1885. 31*s.*

83. Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and Army Medical Department. 1852–1886. 23*s.*

84. Report for 1888–89. Presented to Parliament. 5½*d.*

*85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4*d.* per week. With Appendices and Monthly Supplements, priced separately.

86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6*d.* per week. With Appendices and Supplements, priced separately.

87. Weekly Weather Report for 1890. Vol. VII. Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

88. Meteorological Observations at Stations of the Second Order for 1886. 25*s.*

89. Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo. 1886–88. By the late W. Reid, M.D. 8*s.* 6*d.*

90. Cyclone Tracks in the South Indian Ocean. (In the Press.)

91. Report for 1889–90. 7½*d.*

92. Charts of Meteorological Data near Cape Guardafui. (In the Press.)

93. Harmonic Analysis of Hourly Observations of Air Temperature and Pressure at British Observatories. (In the Press.)

94. Hourly Readings. 1887. (In the Press.)

95. Meteorological Observations at Stations of the Second Order. 1887. (In the Press.)

NON-OFFICIAL.

No. 1. Report to the Committee on the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6*d.*

†2. Report to the Committee on the Meteorology of the North Atlantic.—By Captain H. Toynbee, Marine Superintendent. 1*s.*

†3. Report to the Committee on the Use of Isobaric Curves.—By Captain H. Toynbee, Marine Superintendent. 1*s.*

4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6*d.*

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* The publication of the Weekly Weather Report began in February 1878.

† The Meteorological Council have given away the copies which were placed at their disposal, but the work can be purchased from the Publishers.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6*d.*

6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1872. 1*s.*

7. Notes on the Form of Cyclones in the Southern Indian Ocean. — By C. Meldrum, M.A., F.R.S. [Out of Print.]

8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 1873. 6*d.*

9. Report of the Permanent Committee of the Vienna Congress for 1874. 1*s.* 6*d.*

10. On the Physical Geography of that part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875.—By Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s.* 6*d.*

11. Report of the Permanent Committee of the Vienna Congress for 1876. 2*s.*

12. Reports to the Permanent Committee of the Vienna Congress on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s.*

13. Report of the Permanent Committee of the Vienna Congress for 1878. 6*d.*

14. Report of the International Meteorological Committee Meeting at Berne, 1880. 1*s.*

15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. 2*s.* 6*d.*

16. Report of the Third Meeting of the International Meteorological Committee, held at Paris, September 1885. 1*s.*

17. Report of the Fourth Meeting of the International Meteorological Committee held at Zürich, September 1888. 4*d.*

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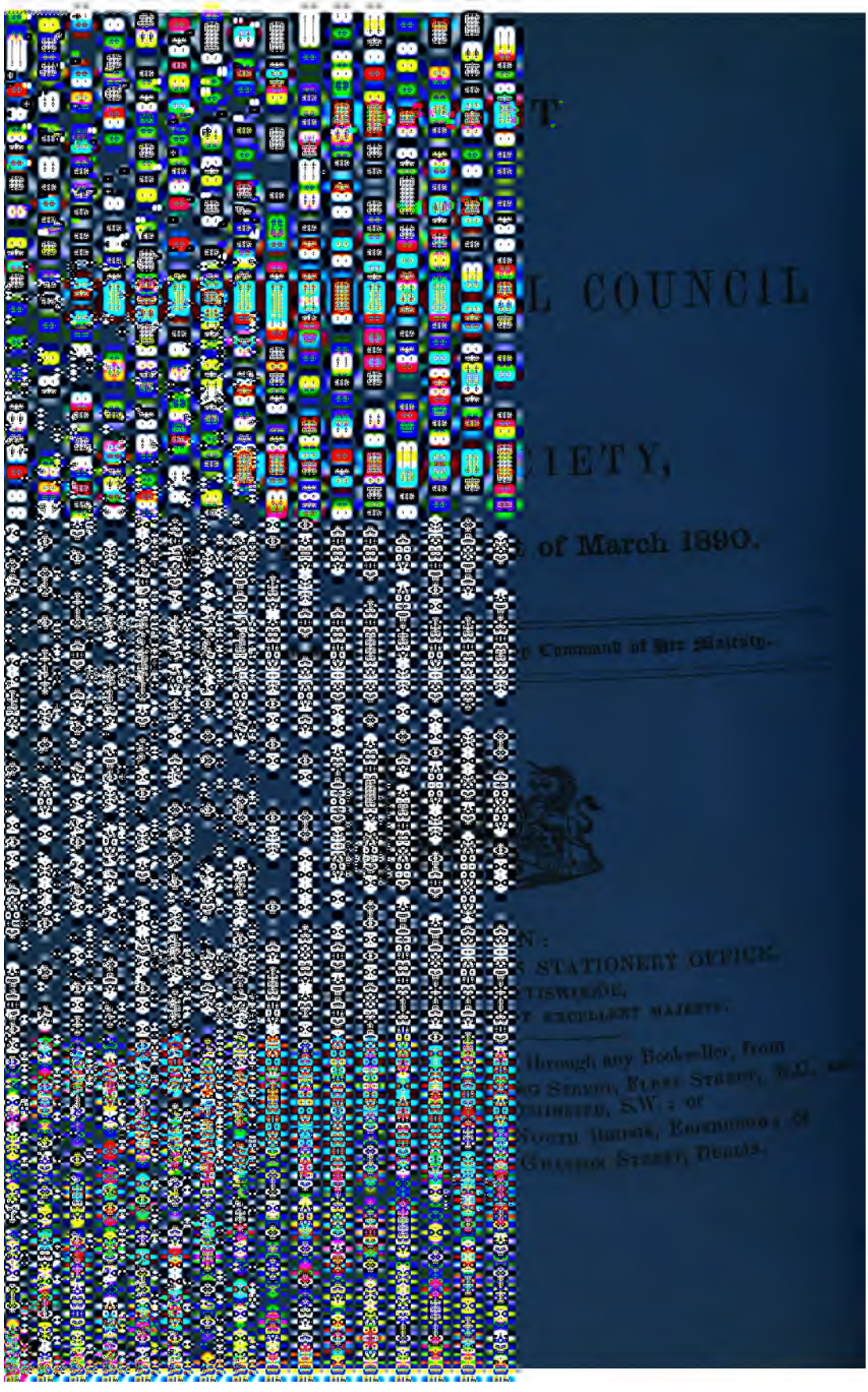
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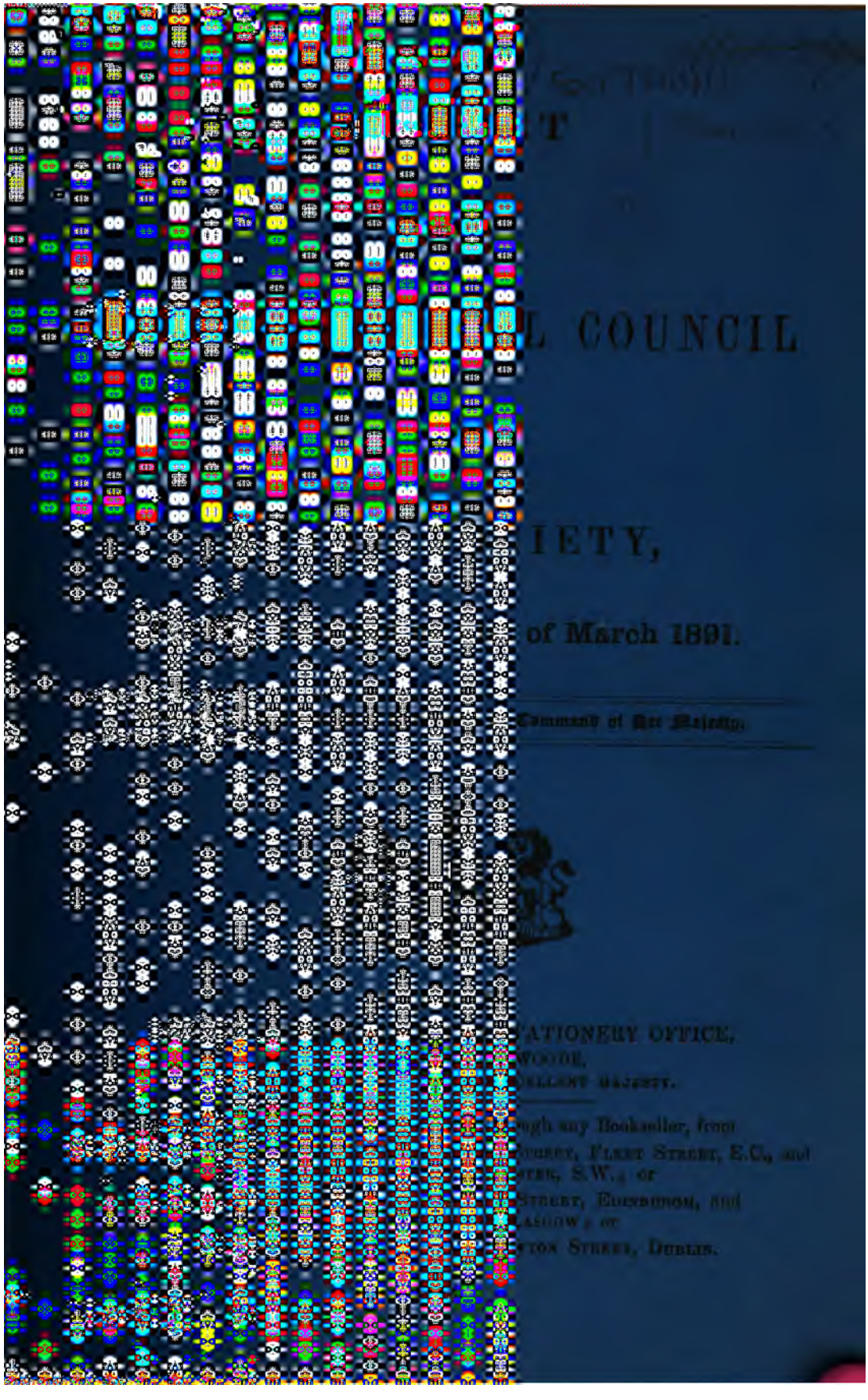
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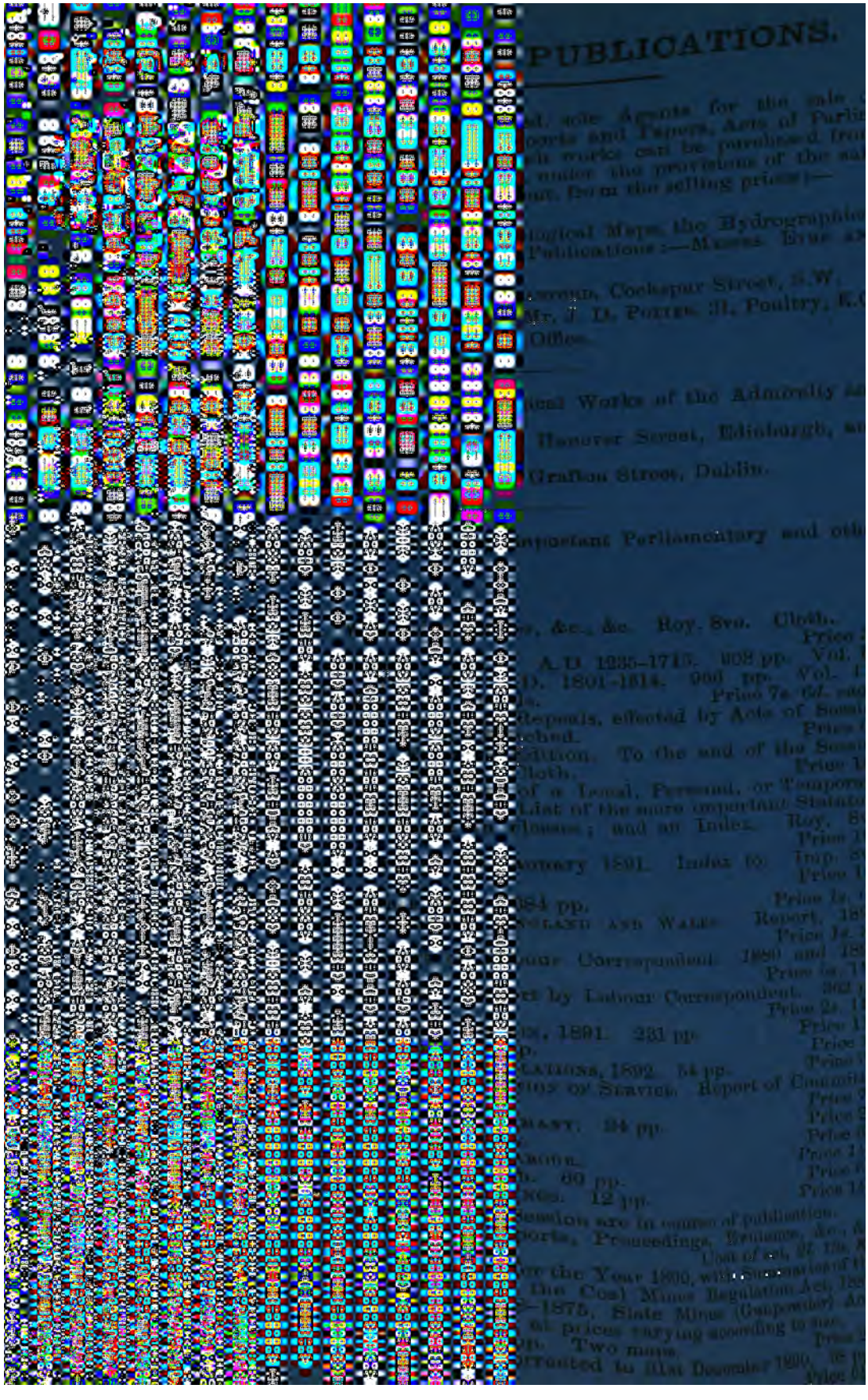

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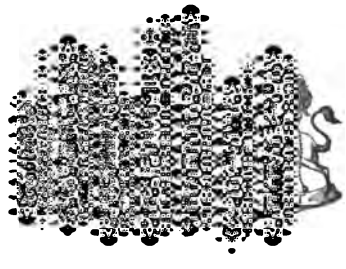

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THE METEOROLOGICAL COUNCIL,

1890–91.

Lieutenant-General Richard Strachey, R.E., C.S.I., F.R.S., Chairman.

Mr. Alexander Buchan, M.A., LL.D., F.R.S.E.

Professor George Howard Darwin, M.A., LL.D., F.R.S.

Mr. Francis Galton, M.A., F.R.S.

Mr. Edward J. Stone, M.A., F.R.S.

Captain William J. L. Wharton, R.N., F.R.S., Hydrographer of the Admiralty.

REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1891.

Introductory.

THERE has been no change in the Council during the year. The executive officers are as in the last Report:—

Mr. R. H. Scott, M.A., F.R.S., Secretary.
Nav.-Lieut. C. W. Baillie, R.N., F.R.A.S., Marine Superintendent.

Transfer of Valencia Observatory.

Purchase of new House for Valencia Observatory.—The Council, having come to the conclusion that it was desirable to transfer their observatory on Valencia Island to a house in the immediate neighbourhood in a more favourable situation, arranged, with the sanction of the Treasury and the assent of the Royal Society, to supply the necessary funds for the purchase of Westwood House, Cahirciveen, in the name of the President and Council of the Royal Society, the legal status of the Meteorological Council not admitting of their entering into a contract of this description. The particulars will be found in Appendix I., p. 23.

Registration of Council as a corporate body.

Registration under Companies Act.—In view of the difficulty that arose in the foregoing matter the Council further resolved to apply to the Board of Trade for registration under section 23 of the Companies Act, 1867, having first obtained the consent of the President and Council of the Royal Society to their action. The matter is now under the consideration of the Board of Trade.

Admission of Boy Clerks.—To regulate in a more satisfactory manner the admission of boy clerks to the Office, rules were framed on the subject during the past year, following as far as practicable the system followed in the Public Service. The rules will be found at Appendix II., p. 25.

The present Report is arranged under three headings:—

I. Ocean Meteorology.
II. Weather Telegraphy.
III. Land Meteorology of the British Isles.

PART I.

Ocean Meteorology.

Collection of information.

Collection of Information—The practice followed by the Office with reference to observers at sea, as described in former Reports, remains unchanged.

Recognition of "excellent" observers.

Appendix III. (p. 26) contains a list of all the observers who during the past year have contributed logs classed as "excellent." Several of these observers have regularly co-operated with the Office for many years. The names which appear in the list for the first time are as follow:—

Captain's Name.	Ship.
George of Wales, H.R.H. Prince (Lieut. and Commr., K.G.).	H.M.S. "Thrush."
Andersen, O. E. - - -	S.S. "Longhirst."
Buckler, J. H. - - -	S.S. "Essequibo."
Day, Lieut. E. A., R.N. - -	H.M.S. "Dart."
Elliott, W., R.N.R. - - -	S.S. "Clan Murray."
Gilpin-Brown, Lieut. F. D., R.N. -	H.M.S. "Egeria."
Gould, H. W. - - -	S.S. "Norse King."
Home, W. E., R.N., M.B., B. Sc. -	H.M.S. "Thrush."
Nicholson, J. I. - - -	"Majestic."
Somerville, Lieut. Boyle, T. R.N. -	H.M.S. "Dart."
Squares, W. G., Chief Officer -	S.S. "Minia."
Speck, F. - - - -	S.S. "Rohilla."
Streater, R. - - - -	"Lutterworth."
Trenaman, R. W. - - -	S.S. "Pascal."
Young, W. H., Chief Officer - -	S.S. "Clan Murray."

Proportion of "excellent" to total number of logs received.

The total number of logs received in the year ending March 31, 1891, is 156, of which 115, or 74 per cent., have been classed as "excellent."

The average number of logs received annually during the five years, 1885–89, was 183, of which the per-centage of "excellent" logs was 75.

The Council take this opportunity of expressing their best thanks to the observers who have assisted them during the past year.

They regret to have to announce the deaths of two of their observers; Capt. W. Hird, ship "Marlborough," who had kept 6 "excellent" logs; and Capt. T. Mesnard, ship "Sierra Miranda," who had kept 9.

Appendix IV. (p. 28) gives a list of meteorological logs and of meteorological reports from stations abroad, received at the Office during the year.

The following summary of the voyages of the ships observing for the Office shows the districts from which observations were received during the year:— Districts from which observations are obtained.

To Baffin's Bay or Greenland - - - - -	4
„ North America, East Coast - - -	17
„ „ „ West „ - - - -	3
Off East Coast of North America - - -	3
To West Indies - - - - -	16
„ South America, East Coast - - - -	19
„ „ „ West „ - - - -	3
„ Australia and New Zealand, viâ Cape of Good Hope	23
At Australian stations - - - - -	7
To India, viâ Suez - - - - -	5
„ India, viâ Cape of Good Hope - - -	22
„ China, viâ Suez - - - -	8
„ Cape of Good Hope - - - -	12
„ East Coast of Africa - - - -	1
Between British Ports - - - - -	4
To Continental Ports - - - - -	9

Red Sea Charts.—The printing of these charts has been delayed by the introduction of new matter relating to the distribution of gales. The charts are now almost completed. Red Sea.

Cape Guardafui Charts.—These charts have been engraved and published. Cape Guardafui.

The Aden Cyclone of June 1885.—These charts have been engraved and published. The Aden Cyclone.

Cyclone Tracks in the Southern Indian Ocean.—These have been engraved and published. Indian Ocean Cyclones.

Current Charts for the Atlantic, Pacific, and Indian Oceans.— The extraction of data from the Remark Books of the Royal Navy has been completed, and the Royal Navy log books are now being examined for the period prior to the introduction of the uniform system of Remark Books. Current Charts.

Southern Ocean.—The extraction of data from the Office logs for this district has been completed, and the log books of H. M. ships are now being dealt with. Southern Ocean.

Supply of Instruments to Stations in the Pacific, &c.—In further continuance of the endeavour to obtain information from the Pacific Islands and other rarely visited parts of the ocean, instruments have been supplied during the year to three stations in British New Guinea, to Fotuna Island, New Hebrides, and to Valua Island in the Banks Group, lying to the north of the last-named group. The Council also intend in the coming summer to supply a meteorological outfit, with a self-recording anemometer, to St. Helena. Pacific Ocean.

Heligoland.—The instruments belonging to the Office at Heligoland have been withdrawn, on the transfer of that island to Germany.

Stock of Instruments belonging to the Office.

Supply and Stock of Instruments.—In Appendix V. (p. 34) is given a list of the meteorological instruments supplied by the Office to ships in the Royal Navy during the year, with a statement for the 31st March 1891 of the stock and distribution of the instruments standing on the books to the account of the Admiralty.

Appendix VI. (p. 35) gives similar information with regard to the disposal of the other instruments belonging to the Office, remaining in store, or which have been supplied to the Mercantile Marine, observatories, telegraph offices, &c.

PART II.

Weather Telegraphy and Forecasts.

Administrative.

There have been no serious interruptions of telegraphic communication, and no changes in the reporting staff, during the year.

A list of the telegraphic reporting stations, British and Foreign, is given in Appendix VII. (p. 36).

The work in this branch of the Office continues to increase. The Daily and Weekly Weather Reports, in particular, have been extended and improved.

Inspection of the Stations.

Inspection of the Telegraphic Reporting Stations.—The telegraphic reporting stations have been inspected during the year, in England by Mr. Ley, in Scotland by Mr. Buchan, and in Ireland and Wales by Mr. Scott. The reports submitted by the Inspectors to the Council, which are printed in Appendix VIII. (p. 37), show that the efficiency of the service continues to be satisfactorily maintained.

Discussion of the reports.

Discussion and Publication of the Information received.—The practice of the Office in collecting, discussing, and disseminating the meteorological information received by telegraph is described in Appendix IX. (p. 55). The Daily Weather Report has appeared regularly during the year; for details see that Appendix. It is distributed free of cost as follows:—To newspapers, seven copies; to seaports, for public exhibition, 71 copies; to Government offices and public institutions, 66 copies; to correspondents of the Office, 73 copies; and to foreign meteorological establishments, 46 copies. Nearly 200 copies are issued regularly to subscribers.

The Weekly Weather Report, with its Monthly Appendices, has also appeared regularly; for particulars of this publication see Appendix IX., p. 56.

Display of information in front of the Office.

Public display at the Office of the State of the Weather on British Coasts.—With a view to the earliest possible supply to the public of the latest information as to the weather received from the principal points on the southern coasts, the substance of the reports received by telegraph at 9.30 a.m. and 3 p.m. every week day, of the state of the weather and sea at the following stations: Yarmouth, Dungeness, the Needles (Hurst Castle), Scilly, Holyhead, and Valencia, is displayed in a conspicuous manner on the front of the Office, 63, Victoria Street.

Weather Forecasts.—Forecasts are prepared three times a day, namely, at 11 a.m., at 3.30 p.m., and 8.30 p.m. The Forecasts prepared at 11 a.m., on the information derived from the 8 a.m. reports, refer to the probable weather between noon on the day of issue and noon on the following day. They are publicly exhibited in several places in London,* and are supplied to the afternoon editions of the newspapers. The 3.30 p.m. Forecasts are employed for storm warnings only, excepting in the hay harvest season, when they are issued, as subsequently explained. The forecasts at 8.30 p.m. are specially prepared for publication in the morning newspapers, but all the forecasts are available for the information of anyone who applies for them at the Office. Forecasts.

The inquiries received through the Post Office for special forecasts during the year amounted to 58, and the personal applications to 45. The rules of the Office relating to such inquiries are stated in Appendix IX. (p. 60). Inquiries at the Office.

The results of a comparison of the Forecasts issued at 8.30 p.m during the year, with the weather actually experienced are given in Appendix X. (p. 62). The following summary shows the successes and failures over the whole United Kingdom, estimated as explained in that Appendix. The results were best, 88 per cent., for England South, and worst, 77 per cent., for Ireland South. Results of Forecasts.

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1890–91.

Districts.	Per-centages.				Total per-centage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	48	35	11	6	83
„ E. - -	53	27	13	7	80
ENGLAND, N.E. - -	54	29	12	6	83
„ E. - -	53	30	13	5	83
MIDLAND COUNTIES -	53	30	13	4	83
ENGLAND, S. - -	58	30	10	3	88
SCOTLAND, W. - -	46	33	14	8	79
ENGLAND, N.W. -	49	34	11	6	83
„ S.W. -	52	31	11	7	83
IRELAND, N. - -	45	34	12	9	79
„ S. - -	42	35	14	10	77
Summary - -	50	32	12	6	82

* Note "partial" implies "more than half."

* Viz., in the City, at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's, Cornhill, and Messrs. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and House of Commons; at Messrs. Elliot's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and Messrs. Pastorelli's, New Bond Street; and at the Office, 63, Victoria Street.

Testing of the Forecasts.

The following table shows for each year from 1882 to 1890, inclusive, the per-centages of complete and partial success of the Forecasts issued at 8.30 p.m. for the whole year.

PER-CENTAGES of RESULTS of FORECASTS for the whole of the BRITISH ISLES.

Year.	Complete Success.	Partial, *i.e.*, more than Half Success.	Total Success.
1882 - -	43	37	80
1883 - -	48	33	81
1884 - -	50	31	81
1885 - -	50	34	84
1886 - -	49	31	80
1887 - -	52	32	84
1888 - -	51	31	82
1889 - -	49	32	81
1890 - -	50	32	82
Average - -	49	32	81

Hay Harvest Forecasts.

Hay Harvest Forecasts.—The Council renewed in 1890 the offer made in previous years to the Royal Agricultural Society, the Royal Dublin Society, and the Highland and Agricultural Society to send Daily Forecasts *gratis* during the haymaking season to a number of observers selected by those Societies, on two conditions, viz., that the information should be made known as widely as possible, and a record of the weather actually experienced sent weekly to the Office. The Societies accepted the proposal, and the Forecasts were issued as shown in the following table:—

LIST of those who received HAY HARVEST FORECASTS in 1890.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass -	Golspie.
	Major Smith - -	Munlochy, Inverness.
1. SCOTLAND, E.	J. Whitton - -	Glamis Castle, by Forfar.
	G. Murdoch - -	Rothiemay, Huntly.
	C. L. W. Forbes -	Aberfeldy.
2. ENGLAND, N.E.	Sir J. Wilson - -	Chillingham Barns, Chatton, Northumberland.
	J. Turner - -	The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck - -	High House, Thorpe, Norwich.
	Sir J. B. Lawes, Bt., and J. H. Gilbert, Ph.D.	Rothamsted, Harpenden.
4. MIDLAND COUNTIES	Royal Agricultural College.	Cirencester.
	E. E. Harcourt-Vernon	Grove Hall, East Retford.
5. ENGLAND, S.	C. Whitehead - -	Barming House, Maidstone.
	E. P. Squarey -	The Moot, Downton, Wilts.
	G. M. Allender -	Stammerham, Horsham.
	M. J. Sutton - -	Reading.

Hay Harvest Forecasts.

Districts.	To whom sent.	Address.
6. Scotland, W.	W. Calder	Castle Hill, Dalreoch, Dumbarton.
	M. J. Stewart, M.P.	Ardwell, Stranraer.
	J. S. R. Ballingal	Eallabus House, Islay.
7. England, N.W.	G. W. Wray	Leyburn, Yorkshire.
	The Earl of Derby, K.G.	Knowsley Hall, Prescot.
8. England, S.W.	Colonel T. Picton Turbervill.	Ewenny Priory, Bridgend, Glamorganshire.
	The Earl of Ducie	Tortworth, Gloucestershire.
	T. Dyke	Long Ashton, Clifton, Bristol.
	R. Neville Grenville	Butleigh Court, Glastonbury.
9. Ireland, N.	E. F. Farrell	Moynalty, Co. Meath.
	J. M. Wilson, J.P.	Currygrane, Edgeworthstown.
10. Ireland, S.	D. A. Milward	Lavistown, Kilkenny.
	W. Talbot Crosbie, D.L.	Ardfert Abbey, Tralee, Co. Kerry.
	The Earl of Rosse, K.P.	Birr Castle, Parsonstown.

The issue of the forecasts commenced on June 11th with those for the South and East of England, and were continued for about five weeks, ending on the 3rd of August over the greater part of Scotland, and a week later in Ireland.

The general result of the issue of these forecasts, shown by the subjoined table, has been prepared solely from the reports of the above-mentioned gentlemen, and is entirely independent of any estimate formed within the Office itself:—

Summary of Results.—Hay Harvest Forecasts, 1890.

Districts.	Names of Stations.	Percentages. Complete Success.	Partial Success.	Partial Failure.	Total Failure.	Total percentage of Success.
Scotland, N.	Munlochy and Golspie	52	35	8	5	87
„ E.	Aberfeldy, Glamis, and Rothiemay	53	42	5	—	95
England, N.E.	Chatton and Ulceby	57	31	10	2	88
„ E.	Rothamsted, and Thorpe	54	32	13	1	86
Midland Counties	Cirencester and East Retford	50	42	6	2	92
England, S.	Reading, Maidstone, Downton, and Horsham.	52	42	6	—	94
Scotland, W.	Stranraer, Islay, and Dumbarton	60	28	12	—	88
England, N.W.	Leyburn and Prescot	47	38	12	3	85
„ S.W.	Tortworth, Clifton, Bridgend, and Glastonbury.	52	36	11	1	88
Ireland, N.	Moynalty and Edgeworthstown	55	37	5	3	92
„ S.	Tralee, Kilkenny, and Parsonstown	50	37	9	4	87
	Mean for all districts	53	36	9	2	89

These figures show that the results for the forecasts for 1890 were about the same as those for 1889, and indicate the highest proportion of success that has ever been reached.

Hay Harvest Forecasts.

The largest general per-centage (95) was attained in the east of Scotland, and the lowest (85) was in England North-west.

A further reference was made to the Board of Agriculture on the subject of the possible extended utilization of these forecasts in agricultural districts, in pursuance of the intention noted in last year's Report.

Supply of Forecasts to the Fleet during the Manœuvres.—At the request of the Admiralty daily forecasts were supplied to the Commander-in-Chief of the "A" Fleet during the continuance of the Manœuvres as in the two preceding years.

Storm warnings.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix XI. (p. 63) are given the names of the stations furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade issued in February 1874.

These stations were, at the end of March 1891, 153 in number, situated:—

72 in England, 16 in Wales, 44 in Scotland, 15 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

A comparison has been made in the Office between the warnings issued during the year and the weather experienced on our coasts, the warnings being tested by the method explained in Appendix IX. (p. 60). The results of this comparison are shown in the following tables:—

RETURN of the RESULT of the COMPARISON between the WARNINGS ISSUED and the WEATHER EXPERIENCED in 1890.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 and 7.	Warnings not justified by subsequent Weather.	Warnings late. Force 9 reached at two Stations before issue.	Warnings partially late. Force 9 reached at one Station before issue.	Storms for which no Warning was issued.
Scotland, N.E. -	40	32	6	2	—	—	Mar. 12,* Ap. 8, June 25.
„ E. -	32	17	11	3	—	1	—
„ N.W. -	44	26	13	2	1	2	June 25.
„ W. -	45	24	13	7	—	1	—
Ireland, S.W. -	53	34	8	8	1	2	Nov. 14.
„ N.W. -	49	32	10	2	3	2	Jan. 14, Mar. 12, Mar. 24, Ap. 9, Nov. 4, Dec. 31.
Irish Sea - -	46	34	4	4	—	4	Jan. 7, Ap. 8, Nov. 14, Dec. 30.
St. George's Channel	40	21	13	6	—	—	—
Bristol Channel -	39	23	14	1	—	1	Dec. 30.
England, S.W. -	35	21	12	1	—	1	Jan. 17.
„ S. -	26	15	9	2	—	—	—
„ S.E. -	23	12	9	2	—	—	—
„ E. -	24	11	9	3	1	—	—
„ N.E. -	29	18	3	6	1	1	Jan. 9, Mar. 12, Ap. 8.
Totals - -	525	320	134	49	7	15	
Per-centages -	—	61·0	25·5	9·3	1·3	2·9	

* This gale was confined to the extreme northern part of the district.

With a view of adding to the efficiency of these warnings a revision of the districts in which the stations are arranged has been made during the year, and further measures taken to improve the record of storms on the coasts by means of which the utility of the warnings are better checked than was formerly the case. Storm warnings.

Notes as to Gales in 1890 for which Warnings were not issued.

Gales, for which no warning was issued, were experienced on 11 occasions. They were in almost all instances confined to very limited portions of the coast, and may be grouped as follows :—

Three (on January 14th, March 24th, and November 4th) were felt in "Ireland, N.W." only. This is the first year in which any attempt has been made to warn this coast at all, as its very exposed position makes it liable to be affected by gales which arise from causes too far distant to be detected by the instruments in our islands in time for warnings to be issued.

One (January 7th) was of a sporadic character—only a few of the stations in the district (the Irish Sea) feeling any gale at all.

Three (January 9th, 17th, and December 30th–31st) resulted from the unexpected extension to an unwarned portion of the coast of gales which had been duly warned for in the other districts where they were felt.

Two (April 8th–9th and November 4th) were caused by a very sudden increase of pressure in the rear of disturbances which appeared to be passing away as unimportant systems.

Those needing special remark were the gales of—

March 12.—A fresh to strong gale from south-west and west felt over the northern parts of the kingdom. Its approach was not indicated by the Reports of March 11th.

June 25th.—Severe south-westerly to westerly gale in Scotland —caused by a depression which was either (1) much deeper on evening of 24th than appeared from the telegraphic reports, or (2) increased greatly in intensity as its centre advanced towards Scotland.

November 14.—Fresh to strong southerly to south-easterly gale felt over "Ireland, S.W." and the Irish Sea. No indication of its approach was given by the reports of the 13th.

December 30th–31st.—An easterly gale felt in the Bristol Channel and Irish Sea. Caused by the advance of a depression to Spain while an anticyclone of great intensity lay over the North Sea and south of Scandinavia. Our southern, eastern, and north-eastern coasts were warned, but the Bristol Channel and Irish Sea did not seem to be threatened.

Comparison of results for 1889 with previous years.

The following table contains a comparative statement of the storm warnings and their results in 1890, and in the ten preceding years. It will be seen that the total per-centage of warnings justified is 86·5, being 5·3 per cent. more than that for the preceding year :—

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
		p.c.	p.c.	p.c.	p.c.
1880	390	58·2	24·6	82·8	13·3
1881	454	58·6	23·3	81·9	14·8
1882	503	61·4	21·1	82·5	14·9
1883	610	56·2	21·6	77·8	20·8
1884	461	66·4	20·0	86·4	12·1
1885	591	55·3	24·0	79·3	19·5
1886	542	55·3	26·9	82·2	15·9
1887	472	55·5	26·1	81·6	16·4
1888	539	55·3	28·6	83·9	14·3
1889	373	47·7	33·5	81·2	16·9
1890	525	61·0	25·5	86·5	9·3

Fishery barometers.

Fishery Barometers.—To add to the means of obtaining warnings of stormy weather by the sea-going population, barometers were many years ago supplied by the Board of Trade on loan to fishing villages and other places on the coast, to be set up for public information. The whole number of stations supplied by the Office with these instruments is 180. Of these 58 are in England, 6 in Wales, 51 in Ireland, 60 in Scotland, 4 in the Isle of Man, and 1 in Jersey. The list is given in Appendix XII., p. 65.

The inspection of the Fishery Barometers in England and Ireland, which was commenced two years ago, has been completed by Captain Toynbee during the past summer.

In almost all cases the instruments were found to be in good order, and they seemed to be valued by the fishermen. Whenever possible, the opportunity of the inspection was taken to impart instruction in the use of instruments in connexion with weather observations.

Simultaneous observations.

Simultaneous Observations.—The Office has continued its co-operation in the system of International simultaneous observations, taken at Greenwich mean noon, as explained in former Reports, which was organised in 1874, at the request of the Chief Signal Officer of the United States.

The number of these observations which have been received during the year from the Royal Navy has been 4,000, and from the Mercantile Marine, 3,820.

PART III.

Land Meteorology of the British Isles.

Observatories and Stations.—The observations of the climate of the British Isles, which are received by the Office from certain

stations, may be arranged in five classes, according to the degree of completeness with which they are made.

Self-recording observatories.

1. The Observatories furnished with self-registering instruments by which all the principal meteorological phenomena are recorded continuously. These alone afford the materials necessary for the study of the periodic variations of the meteorological elements.

Anemographic stations.

2. Anemographic stations furnished with instruments registering the wind only. The records from these stations relate rather to weather as distinguished from climate, and are especially important in connexion with storms. They are often useful in affording evidence available in courts of law with respect to collisions at sea, and damage done by wind.

Stations of Second Order.

3. Stations of the Second Order furnishing climatological information from eye observations taken twice a day. The observers at these stations are all volunteers.

Telegraphic Reporting Stations.

4. The Telegraphic Reporting Stations, at which the observations are taken by eye, but supplemented in some cases by self-recording aneroids, &c., supply the material upon which the daily weather reports and forecasts are based. The hours of observation at these stations are determined by the requirements of the telegraphic system, as explained in Part II., but the data which they furnish are also utilized to afford climatological information for parts of the country where Stations of the Second Order do not exist.

Extra stations.

5. Extra stations furnishing returns with less completeness and detail than those of Class 3.

Sunshine stations.

A continuous record of the amount of bright sunshine is received from 42 stations in the British Isles, of which some are first or second order stations, whilst from others the sunshine record is alone received. See Appendix XIII., p. 66.

A fuller account of these several stations and of the methods employed by the Office in dealing with their records will be found in Appendix XIV., p. 67.

Documents received.

Appendix XV., p. 70, contains a list of all documents relating to the land meteorology of the British Isles received at the Office during the year.

Inspection of stations.

Inspection of the Stations.—The self-recording observatories and the anemographic stations (Classes 1 and 2), as well as the Telegraphic Reporting Stations (Class 4), are regularly visited each year by the Inspectors of the Office. The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 3), some belong to the Royal Meteorological Society, and these are visited by an Inspector appointed by that Society, an allowance being made by the Office toward the cost of the inspection, in accordance with the recommendation of the Treasury Committee (1877). The remaining Stations of the Second Order, including those belonging to the Scottish Meteorological Society, are visited most of them annually by the Inspectors of the Office. The Superintendent of the Kew Observatory, Mr. G. M. Whipple, and his chief assistant, Mr. T. W. Baker, are specially employed to inspect and report on the self-registering apparatus, and on the

Inspection of stations.

photographic processes at the observatories. Extracts from the Reports of the Inspectors are given in Appendix VIII., p. 37.

Reports supplied to Registrar General for Ireland.

Information supplied to the General Register Office, Dublin.—Reports from eleven of the Irish stations of the Office have been regularly supplied to the Registrar General for Ireland, for his Weekly and Quarterly Returns.

Publications.

The Quarterly Weather Report.—The volume for 1880 has been completed, and with it the issue of these Reports, with the reproduction of the continuous records from the seven observatories, comes to an end. A list of the volumes of this publication, with the dates of their several appearances, was given in the last Report. In its place there have been successively issued, first, the Monthly Weather Report for the years 1884 to 1887, and subsequently the Monthly Summary of the Weekly Weather Report. It is intended to publish a quarterly summary of the principal weather changes for the years 1881 to 1883, so as to connect the Quarterly Weather Reports with the Monthly Weather Report series.

The Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office (see Appendix IX., p. 56), supplies, by its synchronous charts and Monthly Summaries, a very complete and instructive view of the chief meteorological changes, day by day, over the greater part of Europe, such as is not to be found in any of the similar publications issued by any other office.

Appendix I. to the Weekly Weather Report for 1890 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature for each district, for the 25 years 1866–1890, and also the Monthly and Progressive values of Accumulated Heat, Rainfall, and Bright Sunshine for all the districts in each month of 1890. Appendix II. to the same Report gives the Weekly and Progressive values for the same elements during the year 1890 (in continuation of Appendix II. for the year 1889), and Appendix III. gives the Mean Weekly values for the following number of years:—

Accumulated Heat and Rainfall, 13 years, 1878 to 1890.
Bright Sunshine - - 10 „ 1881 „ 1890.

Appendix IV. gives for each district, for the 13 years 1878 to 1890, the mean temperature for each week in the year.

Hourly Readings of Meteorological Instruments.—The Volume of Hourly Means for 1887, which, as was announced in the last Annual Report, the Council have determined to substitute for the Hourly Readings hitherto published, has been issued. It comprises:—

(1.) *Hourly* means of pressure, temperature, the difference between the dry and wet bulbs, and of wind components, together with the amount and frequency of rain; these hourly means will be for periods of (*a*) five days, (*b*) calendar months, and (*c*) the year.

(2) The daily, five-daily, monthly, and yearly means of pressure and temperature, and amounts of rainfall. Publications.

(3.) The daily extremes of pressure and temperature, and the maximum hourly fall of rain in each month.

(4.) The number of observations of wind and the mean velocity, referred to eight points, for each hour of the day and for the day, for each month; and also the mean velocity of the wind, irrespective of direction, at each hour of the day for each month.

The computation of mean hourly values of the temperature of the air and of barometrical pressure for the seven observatories and for each month has been completed for several years, and is still being carried on. The work is somewhat lengthy, but considerable progress has already been made with it.

Observations at Stations of the Second Order.—The volumes for 1886 and 1887 have appeared.

As mentioned in the last Report, the number of stations returns from which are published *in extenso* has been reduced to 21, while at the same time the number of those from which monthly means and summaries are published has been largely increased.

The following is the list of stations for which returns have been published for 1887:—

STATIONS for PUBLICATION in DETAIL on Form A., 21 in Number.

Stations.	In connexion with	Years already published in detail.	Remarks.
Glasgow - -	M. O.	11	Formerly observatories. 10 years hourly readings already published.
Stonyhurst -	M. O.	18	Continuous records of pressure, temperature, wind, and rainfall still available, except for Armagh, which furnishes wind and rain only. For Stonyhurst and Armagh the records for 1884 and 1885 have been published among the stations on Form A.
Armagh - -	M. O.	13	
Dunrobin Castle -	S. Met. Soc.	7	
Braemar - -	S. Met. Soc.	7	High-level station (1,113 feet).
Dundee - -	S. Met. Soc.	7	
Wolfelee - -	S. Met. Soc.	1	
Scarborough -	R. Met. Soc.	6	
Hillington -	R. Met. Soc.	10	
Churchstoke -	R. Met. Soc.	11	Sutton Coldfield to be substituted for Churchstoke for 1889.
Carmarthen -	R. Met. Soc.	12	
Margate - -	R. Met. Soc.	5	
Babbacombe -	R. Met. Soc.	10	Dartmoor (1,395 feet) to be substituted for Babbacombe in 1890.
Swanbister (Orkneys).	M. O.	1	This is the most northern station available, and there is a continuous record of wind.

Publications.

Stations.	In connexion with	Years already published in detail.	Remarks.
Laudale - -	M. O.	8	
Douglas (Isle of Man).	M. O.	9	
Southampton -	M. O.	9	At both of these stations there are long series of observations available taken by the officers of the Ordnance Survey.
Dublin (Mountjoy Observatory).	M. O.	1	
Markree Castle -	M. O.	12	
Parsonstown -	M. O.	14	
Londonderry -	M. O.	8	

List for Publication on Form B. (Monthly Means and Summaries).

Swanbister.
Ⓢ Lairg.
Ⓢ Dunrobin Castle.
Ⓢ Gordon Castle.
Ⓢ Glencarron.
Aberdeen.
Ⓢ Fort Augustus.
Ⓢ Braemar.
Ⓢ Fort William.
Ⓢ Lednathie.
Laudale (Argyleshire).
Ⓢ Dundee.
Ⓢ Ochtertyre.
Ⓢ Callton Mor.
Glasgow.
Ⓢ Rosewell.
Ⓢ Rothesay (Isle of Bute).
Ⓢ Marchmont.
Ⓢ Wolfelee.
Ⓢ Pinmore (Ayrshire).
Ⓢ Glenlee.
Ⓜ Cramlington.
Ⓢ Cargen.
Durham.
Newton Reigny.
Aysgarth (Yorkshire).
Ⓜ Scarborough.
Cronkbourne (Douglas), Isle of Man.
York.
Stonyhurst.
Ⓜ Wakefield.
Prestwich.
Ⓜ Llandudno.
Ⓜ Buxton.
Ⓜ Cheadle.
Ⓜ Hillington (Norfolk).
Leicester.
Uppingham.
Ⓜ Churchstoke (Montgomeryshire).
Geldeston (Beccles).
Ⓜ Bennington.
Ⓜ Cheltenham.
St. David's.
Ⓜ Carmarthen.
Ⓜ Berkhamsted.
Kew.
Ⓜ Margate.
Southampton (Ord. Survey Office).
St. Leonard's.
Eastbourne.
Ⓜ Southbourne.
Ⓜ Rousdon.
Ⓜ Dartmoor.
Ⓜ Babbacombe (Torquay).
Falmouth.
Londonderry.
Ⓢ Lissan (Co. Tyrone).
Armagh.
Brookeborough (Colebrooke Park).
Markree Castle (Co. Sligo).
Dublin (Glasnevin).
Dublin (Mountjoy Observatory, Phœnix Park).
Dublin (City).
Parsonstown (Birr Castle).
Ⓜ Killarney.
Valencia.

The Stations marked Ⓢ belong to the Scottish, and those marked Ⓜ to the Royal Meteorological Society.

Observations on Ben Nevis.

Observations on Ben Nevis.—The arrangements made with the Directors of the Observatory on the summit of Ben Nevis, at a height of 4,406 feet above the sea, and explained in the Report for 1885, remain in force, and the Council have continued the annual grant of 100*l.* towards the expenses of the Observatory,

and have received MS. copies of all the meteorological observations taken. Observations on Ben Nevis.

The building of the new observatory at Fort William, which has been constructed in connexion with that on Ben Nevis, is now completed. It has previously been explained that the Council had agreed to subsidize this observatory to the extent of 250*l.* a year, and supply it with the necessary outfit of instruments. These were sent down and erected in July 1890, and the observations began on July 14. Observatory at Fort William.

Removal of the Anemometer from Swanbister, Orkney.—In the month of August the anemometer which had been situated at Swanbister, in the parish of Orphir, Orkney, since the death of Dr. Clouston, of Sandwick, was removed to Stenness schoolhouse. The change was rendered necessary by the removal of Mr. Fortescue from Swanbister. Mr. Whipple superintended the operations. Change of position of station in the Orkney Islands.

Sea Surface Temperature on the Coasts of the British Isles.—These observations, which are obtained through the courteous assistance of the Admiral Superintendent of Naval Reserves, the Trinity House, and the Commissioners of Irish Lights, are still continued, and a large amount of valuable information is thereby collected. Sea Surface Temperature.

Cloud Photography and Measurement.—This subject has continued to receive attention, but as yet thoroughly satisfactory results have not been obtained. Cloud Photography.

The methods formerly adopted for this work have been considerably modified, and the present arrangements are still of a somewhat tentative character; but it is hoped that results will eventually be obtained under the improved system, by means of which the difficulties of observation and computation hitherto met with will be overcome, and a practical method arrived at which will enable the height and velocity of clouds to be readily ascertained by the comparison of photographs made simultaneously at the extremities of a base of known length.

The Bridled Anemometer.—This instrument, devised by Professor Stokes for recording the force of strong gusts of wind, has been altered in accordance with the conclusions arrived at from the experiments carried out by Mr. W. H. Dines mentioned in the last Report, and further experiments have since been made by him in order to determine the scale of the instrument. Further experiments have also been carried on by Mr. Dines at Hersham with respect to other questions relating to wind from which many very interesting results are anticipated. An account of these will be found at Note A., p. 22. The Bridled Anemometer.

Electrical Anemometer.—The electrical recording anemometer, that had been removed from Valencia on account of the continued irregularities in its action, which it had not been found possible to Electrical Anemometer.

remedy, was erected at Kew for a fresh trial, after careful cleaning and the adoption of further modifications of parts of the mechanism in the hope of removing the defects in the operation of the apparatus. A prolonged trial and comparison of the records with the self-recording anemometer of the usual construction having conclusively shown that the electrical arrangement could not be relied on, the instrument was dismounted in July last, and it is not intended to persevere further with the experiment.

Violle's Actinometer.

Violle's Actinometers.—At the request of the Solar Physics Committee the Council have undertaken to institute some experiments at Kew Observatory on Violle's apparatus for measuring solar radiation. A series of observations have been made with two Violle's actinometers (boules conjuguées) in order to ascertain whether these instruments can be relied on to afford trustworthy and comparable measures of isolation, and also whether they are suited for the use of observers who have had no special training in the use of physical apparatus. After the thermometers had been verified, and the constants of the instruments, viz., their masses, dimensions, and respective rates of cooling, had been determined, they were subjected to a prolonged comparison, exposed to the sun under constant conditions. Subsequently several special series of observations were made with variations of the blackened surface, and with changes in the position of the instruments, in order to ascertain in what degree their indications are affected by such changes. The results have been communicated to the Committee on Solar Physics, and are now under discussion.

Trevandrum observations.

The negotiations mentioned in the last Report with regard to the discussion and publication of the meteorological and magnetic observations made by the late J. Allan Broun, F.R.S., in the years 1853 to 1865, at Trevandrum and Agustia in Southern India have been continued, with the result that the Indian Meteorological Department has agreed to undertake the work as far as regards the meteorological data. The whole of the records have accordingly been despatched to India, except those relating exclusively to magnetical work.

Library.

Library.

The library contains standard works on Meteorology and the allied Sciences, and is, besides, particularly rich in Transactions, Proceedings, Reports, and other Publications which give a large mass of Meteorological observational data from all parts of the world, extending over many years. It consists at present of over 11,000 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men for reference at the Office.

Appendix XVI., p. 75, contains a list of the additions to the library during the year, which have been catalogued upon cards, and are entered in the reference catalogues under (1) Authors, and (2) Subjects.

Expenditure.

Financial.

Appendix XVII., p. 96, shows the receipts and payments during the year ending 31st March 1890. The amount voted by Parliament was 15,300*l.*, as in the previous year.

The following abstract of expenditure shows the amount properly chargeable to the year in question, and its distribution under the various heads, together with the increase or decrease in 1890–91 as compared with the previous year:

Net Expenditure.	1889–90.	1890–91.	Increase.	Decrease.
General Administration:	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Payment of Council -	955 18 4	988 15 0	32 16 8	—
Secretary - -	800 0 0	800 0 0	—	—
Office - - -	801 4 2	789 14 0	—	11 10 2
Rent, fuel, and lighting -	701 14 3	726 10 3	24 16 0	—
Alterations to premises, attendance, and contingencies - -	474 7 6	736 16 2	263 8 8	—
Expenses incidental to International Meteorological Congress -	5 2 0	37 9 8	32 7 8	—
Pensions - -	186 16 4	186 16 4	—	—
Special Researches -	710 10 6	950 13 3	240 2 9	—
Land Meteorology -	3,544 9 11	3,412 10 0	—	131 19 11
Weather Information -	3,777 19 5	3,759 17 11	—	18 1 6
Inspections - -	664 2 5	706 8 9	42 6 4	—
Ocean Meteorology -	2,736 9 4	2,294 5 2	—	442 4 2
Total - - £	15,358 14 2	15,390 16 6	635 18 1	603 15 9

In the year 1890–91 the sum of 1,515*l.* 10*s.* 8*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, and rental of private wires.

(Signed) R. Strachey,
Chairman.

NOTE A.

In the Report of 1890 it was stated that Mr. Dines was carrying out a series of experiments on the resistance of plates of various forms at oblique incidences to the wind. These experiments were carried out with skill and care, and the results have been communicated to the Royal Society in a valuable paper.* It is unnecessary to give an account here of the experiments, and it will suffice to say that the conclusions arrived at are interesting and novel, so that the Council feel that their support of the investigation has been fully justified.

On the suggestion of the Royal Meteorological Society, the Council requested Mr. Dines to carry out on their behalf a series of experiments for the purpose of comparing various forms of anemometer under the action of the natural wind. He hopes ultimately to make comparisons between—

1. A medium-sized Robinson anemometer.
2. A small Robinson anemometer.
3. Richard Frères anemometer.
4. Dines's self-adjusting helicoidal instrument.
5. A circular-pressure plate.
7. Sir G. Stokes's bridled anemometer.
8. An air-meter.

When the experiments are completed, a final report on all these instruments will be submitted to the Council.

For the present it will suffice to say that experiments were made on December 30th, 1890, for comparing the Kew pattern Robinson anemometer (with factor 2·00), an air-meter, and a tube anemometer. The constants of the air meter had been carefully determined by means of a series of experiments with the whirling machine. The tube anemometer was a combination of Lind's and Hagemann's instruments. The instruments were kept in action during about 25 minutes, with the result that the mean velocity of wind deduced from—

1. The Kew instrument, was 14·50 miles an hour.
2. The air-meter, was 15·62 miles an hour.
3. The tube anemometer, was 16·5 miles an hour.

Mr. Dines has also been making some supplementary experiments with his whirling machine on the resistances of curved plates and vanes. The work is nearly finished, and his report will be communicated to the Royal Society.

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* "On Wind Pressure on an inclined Surface," by W. H. Dines, *Proc. Roy. Soc.*, vol. xlviii., pp. 233–257.

APPENDIX.

APPENDIX I.

CORRESPONDENCE with the ROYAL SOCIETY as to PURCHASE of the LEASE of a HOUSE for the VALENCIA OBSERVATORY.

Meteorological Office,
January 12, 1891.

SIR,

I AM directed by the Meteorological Council to forward, for the consideration of the President and Council of the Royal Society, copies of letters* that have passed between the Meteorological Office and the Treasury relative to the proposed purchase of the lease of a house at Valencia, in Ireland, for an observatory in place of the present building now so used.

The Meteorological Council being satisfied that, so long as the meteorological services at present conducted under their supervision are maintained, an observatory at Valencia will be necessary, have been led to the conclusion that it is very desirable to take advantage of an opportunity that has now presented itself of securing, for what may be practically regarded as a permanency, a building much more conveniently situated and otherwise more suitable than the house now occupied for this purpose.

The constitution of the Meteorological Council and their dependence on the annual Parliamentary grant would make it impossible for them to enter into an agreement such as is involved in the purchase of a lease for a long term of years; and it has occurred to them that the object they have in view might be easily attained if the Royal Society would agree to become the purchasers of the lease, the purchase money and ground rent, together with all other liabilities, being at the entire charge of the Meteorological Office.

The Meteorological Council have at their command a sufficient sum to purchase the lease, viz., 1,400*l.*, and they can without any difficulty meet all other charges that may arise in connexion with the transaction.

They considered it to be essential to solicit the approval of the Treasury to the arrangement before addressing the Royal Society, and they have now obtained this necessary authority, and have also been informed that the representatives of the present leaseholders are prepared to sell for the sum already named.

Together with the letters before referred to, I also have the honour of forwarding, for the information of the President and Council of the Royal Society, a copy of the lease, which, it will be seen, is held from Trinity College, Dublin, for the residue of a term of 99 years, of which about 25 years have expired. The obligations under the lease are not in any way onerous or likely to give trouble in the future.

Should the President and Council of the Royal Society assent to this proposal, as it is hoped they may do, there would seem to be no necessity for entering into any formal agreement between the Society and the Meteorological Council, which is in fact a Committee of the Royal Society, recognised by the Treasury for the discharge of certain duties.

* Not printed here.

The contemplated arrangement would constitute the Royal Society the absolute owners of the lease, on the understanding, first, that all pecuniary liabilities would be discharged by the Meteorological Council from the funds at its disposal; second, that in the event of circumstances arising of whatever nature, to lead the Royal Society to desire to sell the lease or otherwise dispose of it, they should have full power to do so at their discretion; and third, that in the event of the lease being sold, the net proceeds should be held at the disposal of the Treasury as required by their letter.

At the same time, I am to add that should the President and Council of the Royal Society be of opinion that any special precautions are required to protect their interests, the Meteorological Council will endeavour to meet their wishes so far as is practicable.

I am, &c.

(Signed) ROBERT H. SCOTT,
Secretary.

To the Secretary
of the Royal Society.

Royal Society, Burlington House,
January 17, 1891.

SIR,

YOUR letter dated January 12, 1891, has been laid before the President and Council of the Royal Society, and I am directed to reply as follows:—

The President and Council are willing to become the purchasers of the lease of the house at Valencia in Ireland, on the conditions named in your letter, viz.:

1. That the Meteorological Council should pay the sum demanded for the lease, viz., 1,400*l.* (fourteen hundred pounds), and all the costs of the purchase, and defray all other pecuniary liabilities connected with it, such as ground rent, rent and taxes, costs and repairs, including those rendered necessary by fire, storm, or tempest, insurance, &c., as stated in the lease.

2. That the Royal Society should have the power to sell the lease or otherwise dispose of it should such a course seem to them at any time desirable.

The President and Council on their part undertake, in the event of the lease being sold, to place the net results of such sale at the disposal of my Lords of the Treasury, as required by their letter of January 9, 1891.

I am, &c.

(Signed) M. FOSTER,
Secretary, Royal Society.

R. H. Scott, Esq.,
Secretary, Meteorological Council.

APPENDIX II.

REGULATIONS for the ENGAGEMENT and EXAMINATION of BOY CLERKS at the METEOROLOGICAL OFFICE.

1. The salaries of boy clerks will begin at from 12*s.* 6*d.* to 15*s.* 6*d.* per week, according to the age of the lads, and will rise annually by 1*s.* 6*d.* per week up to a maximum of 20*s.* per week.

2. Candidates must not be less than 15 and not more than 17 years of age on the first day of the examination referred to in the next paragraph.

3. No boy shall be eligible to serve as a boy clerk in the Meteorological Office who has not passed an examination recognised by the Council as equivalent to that of the Civil Service Commission in the following subjects, viz.:—

Handwriting,
Orthography, and
Arithmetic, including vulgar and decimal fractions.

4. Boy clerks will not be retained as such after completing their 20th year, but will be eligible, subject to Rule 5, for appointment to the regular staff, when suitable vacancies occur, after two years (or if admitted after 17 years of age, one year) of good service, to the satisfaction of the Secretary.

They will also be considered eligible, subject to Rule 5, to fill suitable vacancies occurring within two years of their leaving the Office, provided they have served in it not less than two years.

5. No boy shall be eligible for appointment to the regular staff unless he has passed two of the examinations in the advanced stage of the Science and Art Department in the following subjects:—

a. Subject 5. Mathematics (II. Stage),
b. „ 6. Theoretical Mechanics,
c. „ 8. Sound, Light, and Heat,
d. „ 9. Magnetism and Electricity,
e. „ 10. Inorganic Chemistry,
f. „ 23. Physiography,

or the same subjects at any other examination recognised by the Council as equivalent.

6. It is to be clearly understood that boy clerks are liable to be discharged at the discretion of the Council on receiving one week's notice.

APPENDIX III.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1891. The figures opposite to each show the total number of such Logs which they have returned to the Office during the period that they have been observing.

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Andersen, O. E. - -	3	S.S. "Longhirst."
Angus, T. S. - - -	3	S.S. "Canton."
Atkinson, S. P. H. - -	4	"Hollinwood."
Balfour, Lieut. and Comr. A. F., R.N.	24	H.M.S. "Stork."
Baxter, A. S. - - -	5	"City of York."
Belding, R. - - -	3	"Atlantic."
Blackburne, Mr. H. S. - -	9	S.S. "Rohilla."
Bolton, S. H. - - -	11	S.S. "Baidar."
Bright, H. - - -	4	"Beltana."
Buchan, J. - - -	21	"Elise."
Buckler, J. H. - - -	1	S.S. "Essequibo."
Cameron, J. G., R.N.R. -	6	S.S. "Germanic."
Campbell, J. - - -	8	"Glengarry."
Campbell, R. - - -	5	S.S. "Elton."
Clapp, Comr. E. S., R.N. -	12	L.H. Tender "Richmond."
Clarke, Comr. A. C., R.N. -	3	H.M.S. "Espiègle."
Couper, W. - - -	3	"Clackmannanshire."
Crighton, A. T. - -	6	SS. "Circe" and S.S. "Amarynthia."
Cromarty, D. S. - -	4	"Cassandra."
Crowley, C. - - -	5	"Alexander Lawrence."
Crutchley, W. C., R.N.R. -	22	S.S. "Kaikoura."
Dart, L. C. - - -	11	"Semantha."
Dawson, Comr. L. S., R.N. -	10	H.M.S. "Rambler."
Day, Lieut. E. A., R.N. -	2	H.M.S. "Dart."
De Horne, M. - - -	2	S.S. "Rohilla."
Docherty, H. - - -	3	"Baron Colonsay."
Dunbar, J. I. - - -	20	S.S. "Arracan."
Elliott, W., R.N.R. - -	1	S.S. "Clan Murray."
England, T. - - -	10	"Jane."
Exham, T. K., F.R.A.S. -	9	S.S. "Esk" and S.S. "Tamar."
Field, Comr. A. M., R.N. -	5	H.M.S. "Egeria."
Frederick, Lieut. and Comr. G. C., R.N.	10	H.M.S. "Dart."
Garnsworthy, T. - -	2	S.S. "Ardancorrach."
George of Wales, H.R.H. Prince, Lieut. and Comr., K.G.	1	H.M.S. "Thrush."
Gilpin-Browne, Lieut. F. D., R.N.	1	H.M.S. "Egeria."
Gould, H. W. - - -	1	S.S. "Norse King."
Gray, J. - - -	14	S.S. "Hope."
Hepworth, C. M. W. - -	8	S.S. "Port Adelaide."
Home, Dr. W. E., R.N., B.Sc.	1	H.M.S. "Thrush."
Irving, P. J., R.N.R. - -	9	S.S. "Teutonic."

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Janes, G.	4	"Middlesex."
Jennings, R. C.	5	S.S. "Colina" and S.S. "Circe."
Kemp, A. H.	4	"Hudson."
Mesnard, T.	9	"Sierra Miranda."
Milne, W. F.	8	S.S. "Esquimaux" and S.S. "Polynia."
Milner, W. H.	10	S.S. "La Plata."
Mitchell, G.	3	S.S. "Trinacria."
Moignard, P.	5	"Fort James."
Molony, E. J.	9	"British Merchant."
Munn, L. A.	4	S.S. "Durban" and S.S. "Spartan."
Murdoch, P.	11	"Sierra Lucena."
Nicholson, J. I.	1	"Majestic."
North, W. G.	15	S.S. "Plato."
Oldham, Comr. C. F., R.N.	11	H.M.S. "Egeria."
Parry, M., F.R.Met.Soc.	16	S.S. "Prydain."
Parson, G. F.	10	"Earnock."
Peebles, R.	14	"Bracadale."
Pope, J.	4	S.S. "Dee."
Powles, F. W.	8	S.S. "Essequibo."
Price, J. H.	5	"Viola."
Pritchard, Lieut. C. E., R.N.	4	H.M.S. "Espiègle."
Quaile, D. W. A.	4	"Craigerne."
Randall, W.	12	"Laomene."
Ritchie, A.	3	"Four Winds."
Rosseter, W. L.	12	"Columba" and "Brenda."
Sargent, A. H.	5	"Pleione."
Scott, G.	5	"Holyrood."
Scott, W.	21	"Winifred."
Simpson, A.	13	S.S. "Australasian."
Simpson, A.	20	S.S. "Traveller."
Somerville, Lieut. Boyle T., R.N.	2	H.M.S. "Dart."
Speck, F.	2	S.S. "Rohilla."
Squares, Mr. W. G.	1	S.S. "Minia."
Streater, R.	1	"Lutterworth."
Thompson, Lieut. H., R.N.	4	H.M.S. "Rambler."
Tizard, Staff-Capt. T. H., R.N.	11	H.M.S. "Triton."
Travers, H. D.	9	S.S. "Tartar."
Trenaman, R. W.	2	S.S. "Pascal."
Trevor-Roper, Dr. G. D., R.N.	2	H.M.S. "Stork."
Trott, S., F.R.Met.Soc.	18	S.S. "Minia."
Wait, A. M.	5	S.S. "Spartan."
Walker, H., R.N.R.	13	S.S. "Servia."
Wheaton, N. J.	12	"Eliza."
Wilson, J., R.N.R.	6	S.S. "Ethiopia."
Woolward, R.	7	S.S "Nile" and S.S. "Don."
Young, Mr. W. H.	1	S.S. "Clan Murray."

Names of deceased observers printed in italics.

Cape Juby (N.W. Africa) -	Hubert Bray, M.R.C.S., L.R.C.P.	9	„ „ „ 1890, February to November.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper -	2	"Lighthouse" Register 1890, January to December.
Cay Lobos (Bahamas) - -	Lightkeepers - -	2	„ „ 1890, January to December.
Cay Sal (Bahamas) - -	T. R. Thompson, Sen., Lightkeeper.	2	„ „ 1890, January to December.
Famagusta (Cyprus) - -	G. Eliades - - -	3	Two observations daily, 1889, January to December.
George Town (British Guiana) -	Robert Ward - -	9	„ „ „ 1890, February to December; 1891, January.
Gibraltar - - - -	Staff-Sergeant H. Spackman, and Sergeant R. Scott, Med. Staff Corps.	12	„ „ „ 1890, February to December; 1891, January.

List of Documents—*continued.*

Place.	Observer.	No. of Documents.	Nature of Observations.
Grand Bassam	G. Baillan, West African Tel. Co.	2	Two observations daily, 1890, March, April.
Heligoland	J. J. Friederichs, Lightkeeper	10	„ „ „ 1890, March to December.
Inagua (Bahamas)	Lightkeepers	1	"Lighthouse" Register, 1890, February to August.
Kyrenia (Cyprus)	M. Fuleiham and C. Natais	8	Two observations daily, 1889, January to December.
Larnaca (Cyprus)	G. P. Voudiziano	8	„ „ „ „ „
Limassol (Cyprus)	Luigi Béraud	8	„ „ „ „ „
Nicosia (Cyprus)	G. Stephen	8	„ „ „ „ „
Papho (Cyprus)	E. A. Malliotis	8	„ „ „ „ „
Principe Island (West Africa)	G. R. Scovell	9	„ „ „ 1890, February to October; 1891, January.
Suva (Fiji)	J. D. W. Vaughan, F.R.Met. Soc.	7	One observation daily, 1890, January to April, July to November.
Teneriffe (San Antonio)	Mrs. W. L. Boreham	4	Two observations daily, 1890, February, November, December; 1891, January.
Teneriffe (Sitio de Cullen)	A. F. Perry	7	„ „ „ 1890, March to December; 1891, January.
Tobago	J. P. Tulloch, M.A., M.D.	12	„ „ „ 1890, January to December; 1891, January, February.
Trinidad	J. H. Hart, Supt. Botanic Gardens.	11	„ „ „ 1890, February to December; 1891, January.
Valua Island (Banks Archipelago)	W. Ford	1	One observation daily, January 1887 to September 1890.
Watling Island (Bahamas)	T. R. Thompson, jun., Lightkeeper.	1	"Lighthouse" Register, 1890, January to December.

List of Documents received from Ships.

Captain's Name.	Ship.	Voyage.	Year.
Andersen, O. E.	S.S. Longhirst	Algoa Bay, Akyab	1889–90
" "	"	Genoa, Philadelphia, Bremerhaven	1890
" "	"	Genoa, Philadelphia	1890
Anderson, Charles	S.S. Achilles	China, viâ Suez	1888–89
Angus, T. S.	S.S. Canton	" "	1890
[1] " "	"	" "	1890
Armstrong, B. G.	R.M.S. Elbe	Brazil	1889–90
[2] " "	"	East coast of South America, Barbadoes	1890–91
Asquith, W.	S.S. Deucalion	China, viâ Suez	1888
Atkinson, S. P. H.	Hollinwood	Melbourne, San Francisco	1889–90
[3] Balfour, Lieut. and Comr. A. F., R.N.	H.M.S. Stork	Simon's Bay, East coast of Africa	1889–90
Barker, R. J. M.	Barque Earl of Aberdeen	Calcutta	1889–90
Bartlett, T.	S.S. Diomed	China, viâ Suez	1889
Baxter, A. S.	City of York	Rio Janeiro, Rangoon	1889–90
Behenna, Richard	Loch Katrine	Melbourne	1890
Belding, Rawstin	Barque Atlantic	River Plate	1890
Bennett, J. T.	Alcester	Batavia	1889–90
[4] Berwick, G. R.	S.S. Strathleven	Chinese Ports, New York, viâ Suez	1890
Bigley, W. B.	S.S. Diomed	China, viâ Suez	1888
Bolton, S. H.	S.S. Baidar	Continental Ports	1890
" "	"	" "	1890
Bright, Henry	Barque Beltana	Adelaide	1889–90
Brown, R. J.	S.S. Titan	China, viâ Suez	1888
Buchan, James	Barquentine Elise	Demerara, Philadelphia	1890
[5] Buckler, J. H.	S.S. Essequibo	West Indies	1890
Bulkeley, T. D.	S.S. Derwent	" "	1889–90
[6] Cameron, J. G., R.N.R.	S.S. Germanic	New York	1890
Campbell, James	Glengarry	Rangoon	1890–91
[7] Campbell, Robert	S.S. Elton	Bombay, viâ Suez, Alexandria, Sulina	1890
[7] " "	"	Ports in the Black Sea and Mediterranean	1890
[8] Clapp, E. S., R.N.	Schooner Richmond	Bahamas	1890
[8] " "	" "	"	1890
[9] Clarke, Comr. A. C., R.N.	H.M.S. Espiègle	Esquimalt, Honolulu, Malden Island, Acapulco	1889–90
Cook, T. H.	S.S. Gulf of St. Vincent	Valparaiso	1890
Couper, William	Clackmannanshire	Sydney	1889–90
Crighton, A. T.	S.S. Amarynthia	Montreal	1890
" "	S.S. Circe	Baltimore	1890
Cromarty, D. S.	Barque Cassandra	New York, Adelaide	1889–90
Crowley, C.	Barque Alexander Lawrence.	New York, Madras, Mauritius	1889–90
Crozier, F. R. M.	H.M.S. Terror		1839–42
" "	"		1839–42
[10] Crutchley, W. C., R.N.R.	R.M.S. Kaikoura	Cape Town, Hobart, Rio Janeiro	1890
[10] " " "	"	" " " "	1890
[11] " " "	"	Cape Town, Wellington, Rio Janeiro	1890–91
Dart, L. C.	Semantha	Calcutta	1889–90
[12] Davies, David	Andora	San Francisco, Sydney	1889–90
[13] Dawson, Comr. L. S., R.N.	H.M.S. Rambler	Sydney, Hong-Kong	1890
[13] " " "	"	China Sea	1890
[14] De Horne, M.	S.S. Rohilla	China, viâ Suez	1890
Dickinson, L. R.	S.S. Atrato	Brazil	1890
Docherty, Hugh	Baron Colonsay	Singapore	1889–90

Captain's Name.	Ship.	Voyage.	Year.
Docherty, Hugh	Baron Colonsay	Port Pirie	1890–91
Dunbar, J. I.	S.S. Arracan	Rangoon, viâ Suez	1890
" "	"	" "	1890
" "	"	" "	1890–91
Elliott, Wm., R.N.R.	S.S. Clan Alpine	Cape Town, Colombo	1890
[6] " "	S.S. Clan Murray	Cape Town, Ceylon, home viâ Suez	1890
" "	" "	Ceylon, viâ Cape Town, home viâ Suez	1890
England, Thomas	Barque Jane	Demerara	1889–90
" "	"	Quebec	1890
[5] Exham, T. K.	R.M.S. Esk	West Indies	1889–90
[5] " "	"	"	1890
" "	S.S. Tamar	Brazil	1890
[16] Field, Comr. A. M., R.N.	H.M.S. Egeria	Thursday Island, Singapore, Hong-Kong	1890
Fordyce, William	County of Edinburgh	Calcutta	1888–89
Foster, Henry	H.M.S. Chanticleer	Madeira, Fernando de Noronha, Cape of Good Hope, Staten Island, Deception Island	1828–29
" "	"	Staten Island, Deception Island, St. Martin's Cove	1828–29
[17] Frederick, Lieut. and Comr. G. C., R.N.	H.M.S. Dart	Surveying off Queensland	1889
[17] " "	"	At Australian station	1889–90
[18] " "	"	" "	1890
[18] " "	"	Australian station, Sandwich Island, New Hebrides	1890
Garnsworthy, Thomas	S.S. Ardancorrack	Havanna, New York, Norfolk (Va.)	1890
[19] George of Wales, Lieut. and Comr. H.R.H. Prince, K.G.	H.M.S. Thrush	Gibraltar, Las Palmas, Bermuda, Halifax	1890
[19] " "	"	Halifax, Bermuda, Jamaica	1890–91
[20] Gillies, W.	S.S. Medway	West Indies	1889–90
"	"	Jamaica, Barbadoes	1890
Gordon, G. G.	Falkland Hill	Cape Town, Lyttleton	1889–90
[21] Gould, H. W.	S.S. Norse King	Montreal	1890
[22] Gray, John	S.S. Hope	Greenland	1890
[23] Griffin, E. J., R.N.R.	R.M.S. Moor	Cape Town	1889–90
[24] " "	"	"	1890
[24] " "	"	"	1890–91
Guthrie, W. E.	S.S. Bellerophon	China, viâ Suez	1888
Hannah, W. T.	S.S. Glaucus	"	1888–89
[5] Hepworth, C. M. W.	S.S. Port Adelaide	Adelaide, viâ Cape of Good Hope, home, viâ Suez	1890
[25] Hicks, G. M.	S.S. Thames	Lisbon, Brazil	1890
Hutchinson, I.	S.S. Orestes	China, viâ Suez	1888–89
[26] Huxtable, R. G.	Barque Lanarkshire	Brisbane, New Caledonia	1890
[27] Irving, P. J.	S.S. Teutonic	New York	1890
Jackson, Charles	S.S. Palamed	China, viâ Suez	1888–89
" M. H. F.	S.S. Telamon	"	1889
" T. S.	S.S. Palinurus	"	1888
Janes, George	Middlesex	Singapore	1889–90
Jennings, R. C.	S.S. Colina	Halifax	1889–90
[28] " "	S.S. Circe	Montreal	1890
" "	"	"	1890
Jones, Henry	S.S. Telemachus	China, viâ Suez	1888–89
Kemp, A. H.	Barque Hudson	New Zealand	1890
[5] King, James	City of Hankow	Monte Video, Philadelphia, Hiogo, San Francisco	1889–91
Lapage, W. P.	S.S. Anchises	China, viâ Suez	1888–89
Martin, T. C.	Loch Tay	Melbourne	1890–91

	Captain's Name.	Ship.	Voyage.	Year.
[29]	Martin, W.	S.S. German	Cape Town	1890
[30]	„	„	„	1890–91
	Mesnard, Thomas	Sierra Miranda	„ Chittagong	1889–90
[31]	Miller, A. T., R.N.	H.M.S. Conway	Off Birkenhead	1890
	Milligan, John	S.S. Jason	China, viâ Suez	1888–89
	„ S.	S.S. Stentor	„ „	1888–89
	Milne, W. F.	S.S. Esquimaux	St. John's, Newfoundland	1890
	„ „	S.S. Polynia	Baffin's Bay	1890
[32]	Milner, W. H.	R.M.S. La Plata	Brazil	1890
	„ „	„ „	W. coast of South America	1890
	Mitchell, George	S.S. Trinacria	Genoa, Philadelphia	1889–90
	„ „	„	Gibraltar, New York, Mediterranean Ports	1890–91
	Moignard, Philip	Fort James	San Francisco	1890–91
	Molony, E. J.	British Merchant	Melbourne, San Francisco	1890–91
[33]	Munn, L. A.	S.S. Durban	Cape Town	1889–90
[33]	„ „	„	„	1890
[34]	„ „	S.S. Spartan	„	1890
	Murdoch, Peter	Sierra Lucena	Melbourne, Rangoon	1889–90
	Murray, Alexander	S.S. Perseverance	Cumberland Straits	1889
	Nicholson, J. I.	Majestic	Calcutta	1890–91
	Nish, H.	S.S. Cyclops	China, viâ Suez	1888–89
	North, W. G.	S.S. Plato	Hamburg	1889–90
	„ „	„	„	1890
	„ „	„	„	1890
	Oldham, Comr. C. F., R.N.	H.M.S. Egeria	Sydney, Tongatabu	1890
[16]	„ „	„	Thursday Island, Singapore, Hong-Kong	1890
	Parry, Moses	S.S. Prydain	New Orleans, Norfolk (Va.)	1890
	Parson, G. F.	Earnock	Port Pirie	1889–90
	Pattman, R.	Barque Loch Torridon	Calcutta	1889–90
	Pearson, C. W.	S.S. Strathleven	Japan, viâ Suez	1889–90
	Peebles, R.	Bracadale	New York, Calcutta	1889–90
	Pike, Thomas	Ben Voirlich	Guayaquil	1889–90
[35]	Pope, James	R.M.S. Dee	West Indies	1889–90
[35]	„ „	„	„	1890
[5]	Powles, F. W.	R.M.S. Essequibo	„	1890
[5]	„ „	„	„	1890
	Price, J. H.	Barque Viola	Buenos Ayres, Calcutta, Pisagua	1889–91
	Pulford, J.	S.S. Patroclus	China, viâ Suez	1889
	Purdy, Thomas	S.S. Dardanus	„	1888–89
[36]	Puttkamer, A. von	Barque Elvira	Paysandu, Calcutta, Buenos Ayres	1889–90
	Quaile, D. W. A.	Barque Craigerne	Sydney, San Francisco	1889–90
	Randall, W.	Laomene	Melbourne, Pisagua	1889–90
[29]	Reynolds, —	S.S. German	Cape Town	1889–90
[37]	Rigaud, H. C.	R.M.S. Tamar	River Plate	1889–90
	„ „	„	„ „	1890
	Riley, James	S.S. Ajax	China, viâ Suez	1888–89
	Ritchie, Alexander	Four Winds	Calcutta	1889–90
	Ross, J. C.	H.M.S. Erebus	-	1839–42
	„ „	„	-	1839–42
	„ „	„	-	1840
[38]	Rosseter, W. L.	Brenda	Calcutta, Demerara, New York	1890–91
	„ „	Columba	Calcutta, Mauritius, New York	1889–90
[5]	Sargent, A. H.	Pleione	Wellington	1890–91
	Scale, R. F.	S.S. Laertes	China, viâ Suez	1888–89
	Scott, George	Holyrood	New York, Calcutta	1889–90
	„ William	Barquentine Winifred	Rio Grand de Sul	1889–90
	Simpson, Alexander (No. 90,667).	S.S. Australasian	Melbourne, viâ Cape Town	1889–90
	„ „	„	Australia, viâ Cape of Good Hope, Batavia, and home viâ Suez	1890–91

Captain's Name.	Ship.	Voyage.	Year.
Simpson, Alexander (No. 19,365).	Barquentine Traveller	Greenland - - - -	1889–90
Smith, E. J. -	S.S. Adriatic - -	New York - - - -	1890
[31] Smith, J. H., R.N.R.	H.M.S. Worcester -	Off Greenhithe - - -	1890
[32] Speck, F. - -	S.S. Rohilla - -	Bombay, Shanghai - -	1890
[40] " " -	" - -	Calcutta, viâ Suez - -	1890–91
Stewart, Alexander -	County of Selkirk -	Calcutta - - - -	1890–91
Streater, R. - -	Barque Lutterworth -	Wellington - - -	1889–90
Stroak, J. D. -	County of Roxburgh -	Calcutta - - - -	1890–91
Swynnerton, Godfrey	S.S. Lennox - -	China, viâ Suez - - -	1889–90
" "	" - -	Hong-Kong, Yokohama, Singapore to New York, viâ Suez -	1890
[41] Symmers, John -	Barque Inverurie -	Rangoon, Rio Janeiro - -	1889–90
[42] Symons, F. J., R.N.R.	S.S. Dane - -	Cape Town - - -	1889–90
Thompson, J. S. -	S.S. Nestor - -	China, viâ Suez - - -	1888
Tizard, Staff Capt. T. H., R.N.	H.M.S. Triton - -	Off British Isles - - -	1884–5
" "	" - -	" - - -	1890
[43] Travers, H. D. -	R.M.S. Tartar - -	Cape Town - - -	1889–90
[44] " " -	" - -	" - - -	1890
[45] Treneman, R.W. -	S.S. Pascal - -	River Plate - - -	1889–90
[45] " " -	" - -	Lisbon, Rio Janeiro, New Orleans	1890
Trott, Samuel -	S.S. Minia - -	Halifax - - - -	1890
[46] " " -	" - -	Nova Scotia - - -	1890–91
[47] Wait, A. McLean -	R.M.S. Spartan -	Cape Town - - -	1889–90
" " -	" - -	" - - -	1890
[48] " " -	S.S. Tartar - -	" - - -	1890
Walker, Henry, R.N.R.	S.S. Servia - -	New York - - - -	1889–90
" "	" - -	" - - -	1890–91
Wheaton, N. J. -	Barque Eliza - -	Rio Janeiro, Barbadoes - -	1890
" " -	" - -	Ceara (Brazil) - - -	1890–91
Wilding, J. -	S.S. Agamemnon -	China, viâ Suez - - -	1888
[49] Williams, John -	Barque Elissa - -	Monte Video, Barbadoes, Georgia	1889–90
Wilson, John, R.N.R.	S.S. Ethiopia - -	New York - - -	1889–90
" " "	" -	" - - -	1890
[50] Woolward, R. -	R.M.S. Don - -	West Indies - - -	1890
[50] " " -	" - -	" -	1890
[50] " "	R.M.S. Nile - -	" - - -	1890

In cases distinguished by marginal numbers the Meteorological Registers were kept chiefly by Officers, as follows:—

[1] Assisted by W. B. Palmer, 2nd Officer, C. A. Williams, 3rd Officer, and H. W. Potter, 4th Officer.
[2] Kept by C. Cottman.
[3] Kept by G. D. Trevor-Roper, Surgeon R.N.
[4] Kept by John Kynoch, 2nd Mate.
[5] Assisted by Officers.
[6] Kept by J. T. Shenton.
[7] Assisted by C. Matthews and R. Knill.
[8] Kept by Fred. W. Holden.
[9] Kept by Lieut. C. E. Pritchard, R.N.
[10] Kept by H. C. Kiddle.
[11] Kept by W. L. Paske, 4th Officer.
[12] Assisted by 1st Officer.
[13] Kept by Lieut. Henry Thompson, R.N.
[14] Kept by E. C. Carter, 4th Officer, D. Asbury, 5th Officer, and N. K. Cornish, 4th Officer.
[15] Kept by W. H. Young, 2nd Officer.
[16] Kept by F. D. Gilpin-Brown, R.N.
[17] Kept by Lieut. Boyle T. Somerville, R.N.
[18] Kept by Lieut. E. A. Day, R.N.
[19] Kept by William E. Home, B.Sc., M.B., Surgeon, R.N.
[20] Kept by William Anderson, 2nd Officer.
[21] Assisted by John Beavan and E. C. Crosby, 1st and 2nd Mates.
[22] Kept by Oscar Lundus, Mate.
[23] Kept by J. V. Williams, 4th Officer.
[24] Kept by H. E. Butler, 4th Officer.
[25] Kept by W. H. Fooks.
[26] Kept by Lockhart W. McLaren.
[27] Kept by Walter L. D. Chapman, 2nd Officer.
[28] Kept by John Dickie, 2nd Officer.
[29] Kept by A. H. Rhodes, 3rd Officer.
[30] Kept by J. George, 3rd Officer.
[31] Kept by the Cadets.
[32] Kept by Mr. Moses, 3rd Officer.
[33] Kept by R. H. Sach, 3rd Officer.
[34] Kept by J. J. Brickhill, F.R.G.S.
[35] Kept by A. Jolliffe, 2nd Officer.
[36] Kept by Cecil R. A. Newby and Charles M. Redhead, R.N.R.
[37] Kept by A. Hackland, 2nd Officer, C. Langmaid, 3rd Officer, and J. Mien, 4th Officer.
[38] Assisted by Mr. Rosewarne, 1st Officer.
[39] Kept by H. S. Blackburn, Chief Officer, F. Hayes, 4th Officer, and D. Asbury, 5th Officer.
[40] Kept by the Officers.
[41] Kept by George Dawson, Chief Officer.
[42] Kept by G. H. Watkins, 2nd Officer.
[43] Kept by James Bowyer, 2nd Officer.
[44] Kept by C. R. Taylor, 3rd Officer.
[45] Assisted by 2nd Officer
[46] Kept by W. G. Squares, Chief Officer.
[47] Kept by H. P. Adams, 4th Officer.
[48] Kept by John Bernard, 4th Officer
[49] Kept by William Tait and H. Woodcock.
[50] Kept by F. S. Newton, 2nd Officer.

APPENDIX V.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Barometers.	Aneroids.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1890, afloat	211	480	1,328	289	258	167	53
Issued since	75	126	365	66	60	30	53
	286	606	1,693	355	318	197	106
Returned since	77	108	325	51	41	29	24
April 1st, 1891, afloat	209	498	1,368	304	277	168	82

INSTRUMENTS supplied, &c. for use at Naval Stations.

April 1st, 1890, in use	61	63	208	21	21	3	11
Issued since	11	4	98	9	8	2	1
	72	67	306	30	29	5	12
Returned since	4	2	28	2	2	—	—
April 1st, 1891, in use	68	65	278	28	27	5	12

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1891.

Afloat in Royal Navy	209	498	1,368	304	277	168	82
In use at stations	68	65	278	28	27	5	12
In store at M.O.	46	49	224	92	110	24	38
„ Chatham	7	10	6	6	7	—	13
„ Sheerness	5	3	32	8	8	5	9
„ Portsmouth	19	50	28	7	11	5	5
„ Devonport	16	34	46	12	13	5	16
„ Queenstown	2	4	21	1	1	—	4
„ Gibraltar	1	1	8	—	—	—	4
„ Malta	11	16	56	8	12	2	17
„ Bombay	4	3	12	4	4	1	4
„ Halifax	4	10	24	3	5	—	14
„ Bermuda	4	12	25	3	5	2	15
„ Jamaica	4	3	31	2	2	—	—
„ Cape of Good Hope	4	7	30	5	6	3	4
„ Trincomalee	4	3	21	4	4	—	—
„ Hong Kong	6	20	12	7	5	—	17
„ Coquimbo	5	4	20	1	1	—	19
„ Sydney	3	5	23	5	3	—	8
„ Esquimalt	9	8	24	3	3	—	—
Total, April 1st, 1891	431	805	2,289	503	504	220	281
Lost, &c. since April 1st, 1890	2	11	294	30	10	15	18
Under repair	8	12	—	—	—	—	—

APPENDIX VI.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Barometers.	Compasses.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1890, afloat - -	107	—	636	—	—	106	342
Issued since - - -	41	—	284	—	—	40	131
	148	—	920	—	—	146	473
Returned since - -	53	—	365	—	—	58	192
April 1st, 1891, afloat - -	95	—	555	—	—	88	281

INSTRUMENTS at Stations, viz., Telegraph Offices, Observatories, Fishing Villages, &c.

April 1st, 1890, in use - -	256	4	247	55	57	54	11
Issued since - - -	13	—	12	6	7	3	2
	269	4	259	61	64	57	13
Returned since - -	13	1	17	8	6	4	2
April 1st, 1891, in use - -	256	3	242	53	58	53	11

DISPOSITION of Board of Trade Instruments on April 1st, 1891.

In merchant ships - -	95	—	555	—	—	88	281
In use at stations - -	256	3	242	53	58	53	11
In store at M.O. - -	64	3	299	21	33	60	137
At Liverpool Agency -	7	7	33	—	—	4	34
„ Aberdeen „ -	3	—	22	—	3	4	12
„ Glasgow „ -	8	—	53	—	—	8	32
„ Dundee „ -	17	—	37	—	—	13	38
„ Hull „ -	8	—	30	—	—	6	26
„ Southampton „ -	7	—	24	—	—	11	34
Total, April 1st, 1891 -	465	13	1,295	74	94	247	605
Lost, &c. since April 1st, 1890	1	—	84	2	1	14	18
Under repair - -	1	—	—	—	—	—	—

APPENDIX VII.

List of Stations reporting Meteorological Observations to the Office by Telegraph on 31st March 1891, with the Names of Observers.

*†Sumburgh Head	Rev. W. Brand	Minister of Dunrossness.
*†Stornoway	J. Forbes	Nicolson Institution.
Wick	J. Sinclair	Watchmaker.
Nairn	Miss Penny	Schoolmistress.
*†Aberdeen	W. Boswell	Assistant at the Observatory.
Leith	W. Hay	Telegraph Clerk.
*†Shields	J. W. Irvine	Do.
Spurn Head	J. H. Watson	Lightkeeper.
†York	H. M. Platnauer, F.G.S.	Curator of Museum.
Loughboro'	W. Berridge	—
†Ardrossan	J. W. Mayes	Telegraph Clerk.
Malin Head	O. O'Doherty	Signalman, Lloyd's.
*†Mullaghmore	K. Kerr	Retired Coastguard Officer.
*†Belmullet	Miss M. J. Tolan	Telegraphist.
†Donaghadee	T. MacGowan	Postmaster.
Parsonstown	E. Haines	Assistant Observer at Lord Rosse's Observatory.
*†Holyhead	Capt. Richards	Keeper of Sailors' Home.
Liverpool	J. Hartnup, F.R.Met.Soc.	Bidston Observatory.
*†Valencia	J. E. Cullum, F.R.Met.Soc.	Superintendent of the Observatory.
†Roche's Point	W. Kennedy	Telegraph Clerk.
Pembroke	S. Blake	Lightkeeper.
*†Scilly	A. Hicks	Signalman.
Prawle Point	W. Hewitt	Coastguard Officer.
†Hurst Castle	G. G. Appleton	Lightkeeper.
†Jersey	J. Fisher	Station Master.
*†Dungeness	W. Batton	Assistant Lightkeeper.
*†London	F. Gaster, F.R.Met.Soc.	Clerk, Meteorological Office.
Oxford	W. Wickham	Radcliffe Observatory.
Cambridge	H. Todd	Observatory.
*†Yarmouth	G. T. Watson	Secretary, Sailors' Home.
‡Hawes Junction	W. H. Bunce	Station Master.

In addition to the above, reports are received daily from the following Continental Stations.

Station.	Authority.	Station.	Authority.
Haparanda	Meteorological Office, Sweden.	†The Helder	Bureau Central Météorologique, Paris.
Hernösand		Cape Gris Nez	
†Stockholm		†Brest (St. Mathieu)	
Wisby		Lorient (Île de Groix)	
Bodö	Meteorological Institute, Norway.	*†Rochefort (Ile d'Aix)	
†Christiansund		†Biarritz	
*†Skudesnaes		†Paris	
Færder		Belfort	
		Lyons	
		Nice	
†The Scaw	Meteorological Institute, Denmark.	Perpignan	
Fanö		Berlin	Cent. Met. Inst. of Germany.
		Wiesbaden	
Cuxhaven	Deutsche Seewarte, Hamburg.	Munich	
		Corunna	Observatory, Lisbon.
		†Lisbon	

Note.—The stations marked with an asterisk (*) report also at 2h. p.m.; and those with a dagger (†) at 6h. p.m.; Lisbon reports at 8h. a.m. and 4h. p.m.

‡ This station now reports by post only.

Paris has ceased reporting at 6 p.m. on Sundays.

APPENDIX VIII.

Report of Inspections, Ireland and Wales.

Gentlemen,

I have to report that I have completed my usual inspections. The only stations unvisited on this occasion have been Malin Head (telegraphic), Londonderry (Second Order), and two Weekly Weather Report stations, Llandovery and Kilkenny.

Telegraphic Stations.

St. Ann's Head, visited September 25.—This station calls for no remark.

Roche's Point, visited September 27.—I found that a new rain-gauge was required, and it has been supplied.

Valencia, visited October 1.—The only matter calling for notice is that there are frequent complaints of delay in the telegrams, owing to lateness of attendance at the local post office. I have further remarks on this station, which will be found in the next section of the Report.

Donaghadee, visited October 6.—This station is good, but the observer's health is not satisfactory, and in damp weather the observations are taken by substitutes, who are fairly competent.

Mullaghmore, visited October 9.—The station is in good order. An endeavour is being made to have the wire carried to the post office here. If this is done it would release the Office from its engagements as to the private wire.

Belmullet, visited October 11.—The station is in good order, but, as is usual at other stations, the space available for rain-gauge and thermometer screen is not adequate.

Parsonstown, visited October 16.—The station is in good order. The wind observations are not satisfactory, as the demesne is thickly wooded. The Council can gather the effect of this from a remark of Dr. Bœddicker's to me, to the effect that, he was often able to photograph with the 3-foot reflector when there was a breeze outside in the open country.

Holyhead, visited October 21.—This station is also in good order. I saw the bridled anemometer. The new arrangement of cups, as ordered by Sir G. Stokes, has been carried out. The instrument has occasionally been worked with quick motion, so as to expand the time scale.

On the whole, I can say that I found all the telegraphic reporters attentive and efficient, and the instruments clean and in reasonably good order.

Tory Island.—As regards the proposed change of the Lloyd's signal station from Malin Head to Tory Island, I learnt, when I was on the coast, on the authority of a lightkeeper now stationed at Tory, that Lloyd's have been unable to get the materials for the proposed signalman's residence landed before the winter, so that this station cannot be ready before Easter.

The regular communication with the island is by post boat (sailing), from Gort-a-hork coastguard station, near the Bloody Foreland, distant about 10 miles from the island. There is no sleeping accommodation near Gort-a-hork, and the post boat only sails once a week. I hear the

the hire of a special boat is 35*s.* at least. Passengers can reach Tory by the steamer from Sligo to Glasgow, landing in a boat. This route probably involves a stay of about four days on the island.

SECOND ORDER STATIONS AND OBSERVATORIES.

St. David's, visited September 24.—The station was, as usual, in excellent order.

Valencia Observatory, visited October 1.—I did not examine the S.R. apparatus, as Mr. Baker was expected in a week from my visit.

I found that the Post Office authorities had not yet removed the posts and wire from Kilbeg Hill. There is a certain quantity of apparatus, cells, &c. at the observatory, the property of the Council. I have instructed Mr. Cullum to prepare a list of this, and send it up for your instructions as to its disposal.

I visited Westwood House, 1 mile from Cahirciveen. This is now vacant. It is an ordinary dwelling-house standing in 20 acres of land, with frontage to road and sea, held under a direct lease from Trinity College, with 60 years to run.

Its situation is much more open than the present locality of the observatory, and the fact of its being within a mile of the town, without the intervention of a ferry, would render communication much easier and cheaper.

Dublin, Mountjoy Observatory, visited October 4.—The observer at this station has been changed, Sergeant Lipscombe having retired; Corporal Stone now takes the observations. He is careful and efficient.

Dublin, Glasnevin Gardens, visited October 4.—This station goes on satisfactorily. We have not had of late as much interference with the instruments by children visiting the gardens as in former years.

Dublin (*Fitzwilliam Square*), visited October 4.—The station calls for no remark; it is always in excellent order.

Lissan, visited October 7.—This is a new station, the records from which are supplied by the Scottish Meteorological Society. It is the property of Sir N. Staples, Bart., who, when at home, is the observer. His substitute, J. Donaldson, the gardener, is very efficient.

The instruments are not of the quality usual at Second Order Stations, as only one of the thermometers is graduated on the stem. The barometer is of the Kew pattern, by Adie of Edinburgh, but bears no distinguishing number that I could discover. The rain-gauge is worn out.

The observer, Donaldson, had received no printed instructions at any time.

The situation of this station is good; the country about is undulating, but less so than at Armagh.

Slieve Gallion, height 1,500 feet, is distant about 4 miles on the North and N.N.W.

Armagh, visited October 8.—The instruments are all in good order. At this station there is an old standard barometer by Newman, which seems to be a very good instrument. I propose that the Council should have this cleaned; and then their own standard, supplied in 1868, might be recalled, and be available for use elsewhere.

Colebrooke, Brookeborough, visited October 8.—This station calls for no special remark.

Markree, visited October 10.—This station is in very good order, Mr. Marth having trained his servant to take the readings accurately.

Currygrane, visited October 15.—This station is satisfactory, the new observer being now quite efficient.

Parsonstown, visited October 16.—At this station a new observer takes the 9 p.m. readings. His name is White, and he has had previous training, so that the work is well done.

I also visited a few fishery barometers and a sunshine record station.

Ballycastle, co. Antrim, visited October 18.—A barometer supplied to this station last summer was reported to be useless. I went down specially and found air in the tube, which I removed.

Carnarvon, visited October 22.—The barometer is suspended just inside the entrance door of the Custom House, and is probably attended to, the diagram being kept correctly. Mr. Holmes, the collector, is a very old correspondent of the Office.

Nevin or *Morfa Nevin*.—A barometer was supplied at Mr. Holmes's suggestion last spring. On inquiry, I found that it had been erected in a private house. I wrote (P.C. 1782) to the effect that it must be erected in some situation accessible to the public, and Mr. Holmes has promised to see that this is done, as the place is within his district. He had never been informed that the barometer had been received. He told me that the same thing had occurred at Carnarvon before his arrival, a barometer supplied for Abersoch, had been intercepted in transit at Carnarvon and suspended in a private house. This is the barometer above referred to as at the Custom House.

Llandudno, visited October 22.—I went to this station to see the sunshine recorder which had been transferred from the Great Orme's Head to the end of the pier by Mr. Whipple in the summer. I found it still somewhat out in level and in azimuth, but set it right. The man in charge of it, John Roberts, the piermaster, seems very intelligent and careful.

Weekly Weather Report Stations.

Waterford, visited September 26.—The observations are carefully taken.

Foynes, visited October 2.—This station is in good order, but the observations are only kept up when Lord Monteagle is at home.

Corrections to be applied to readings of—

Stations.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare Therm.	Remarks.
Stations of the Second Order.						
Armagh	−0·2	−0·3	−1·0	—	—	Grass min. +0·7. Kew standard −1·2.
Brookeborough	−0·5	−1·0	−0·1	+1·0	—	Observer reads high.
Dublin (City)	−0·3	−0·3	−0·8	0·0	—	
Dublin (Phœnix Park)	−0·4	−0·5	−0·2	0·0	−1·0	Grass min. −0·5.
Edgeworthstown	−0·6	−0·6	−0·6	+0·2	—	Do. +0·4.
Glasnevin	−0·2	−0·4	−1·0	+0·4	—	Do. −0·2.
Lissan	−0·8	−0·9	0·0	+0·5	—	
Markree Castle	−0·1	−0·2	0·0	+0·1	−0·2	Kew standard −0·1
Parsonstown	−0·5	0·0	−0·4	0·0	—	
St. David's	−0·2	−0·3	0·0	−0·1	—	Grass min. −0·2.

Stations.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare Therm.	Remarks.
Telegraphic Reporting Stations.						
Holyhead	−0·1	−0·2	−0·2	+0·4	−0·2	
Mullaghmore	−0·1	−0·1	+0·1	+0·5	−0·2	
Belmullet	−0·2	−0·1	−0·1	−0·2	—	No spare ther.
Donaghadee	−0·5	−0·6	−0·1	−0·2	−0·5	
Parsonstown	−0·8	−0·1	−0·8	−0·3	—	No spare ther.
Valencia	−1·1	−0·7	−0·3	+0·2	−0·2	
Roche's Point	−0·7	−0·7	−0·4	+0·2	—	No spare ther.
St. Ann's Head	−0·2	−0·5	+0·2	−0·5	−0·3	
Malin Head not inspected this year.						
Weekly Weather Report Stations.						
Killarney	−0·2	−0·2	0·0	0·0	—	
Waterford	−0·7	−0·8	−0·2	0·0	—	
Foynes	—	—	−0·2	+0·2	—	
Londonderry, Kilkenny, and Llandovery not inspected this year.						

(Signed) Robert H. Scott.

Report of Inspection—Scotland.

Barometers.—During August the inspection of the barometers did not include a comparison with the standard mercurial barometer. This comparison was made as regards the last 12 stations inspected, which is inclusive of six barometers not previously reported on to the Council. From the direct and indirect comparisons made, I am able to report that the whole of the barometers specified in the annexed table are correct, allowance for instrumental errors being made, are in good order, and the observations accurately made.

Table I.

Stations.	Inspector's Standard, No. corrected.	Rep. Baro. uncorrected.	Check Baro. uncorrected.	Remarks.
	ins.	ins.	ins.	
Laudale	—	30·248	30·242	Check barometer is 8 feet higher.
Fort William	—	30·206	—	
Fort Augustus	—	29·774	—	
Glencarron	—	29·130	—	
Lairg	—	28·835	—	
Dunrobin	—	29·120	—	
Wick	—	29·114	—	Standard mercurial barometer not taken this year to these stations.
Swanbister	—	29·776	—	
Stornoway	—	29·800	29·800	
Nairn	—	29·648	29·648	
Gordon Castle	—	29·486	—	
Aberdeen	—	29·173	29·170	Check is standard of observatory.
Braemar	—	28·200	28·180	Do. old bar. now out of order.
Lednathie	—	29·189	—	
Dundee	—	29·285	—	
Callton Mor	29·935	29·900	—	
Rothesay	29·954	29·958	—	
Ardrossan	29·893	29·888	29·854	Check barometer in Mr. M.'s house.
Glasgow	30·028	30·030	—	
Clober (Milngavie)	29·718	29·694	—	
Ochtertyre	29·680	29·670	—	
Hawick	29·462	29·462	—	
Wolfelee	28·800	28·800	—	
Marchmont	29·676	29·676	—	
Edinburgh	30·039	30·082	—	Check is a Redier's barometer.
Leith	30·480	30·486	—	
Rosewell	29·643	29·632	—	

Thermometers.—The minimum thermometers were this year again very specially examined, but with a result scarcely so satisfactory as last year. The following were out of order: At Wick about 4°·0 were lodged near the top of the tube. A comparison of the past readings will show how long this thermometer had been out of order. At Rothesay a minute portion of spirit, about 0°·3, was lodged at the very top of the tube. At Leith 1°·8 of the spirit was lodged at the top of the tube. This was discovered by the observer about five months ago, who since then has regularly added fully a degree and a half to each reading. All these thermometers were rectified.

New minimum thermometers have been supplied to Dunrossness and Nairn.

TABLE II.

Stations.	Standard No. 4,433, corrected.	Dry Bulb.	Wet Bulb.	Spare Thermometer.	Max. Thermometer.	Min. Thermometer.	Time in Water in Minutes.	Change of Temperature.	Remarks.
	°	°	°	°	°	°		°	
Laudale -	60·4	+0·2	+0·2	—	+0·2	+0·3	150	+0·4	C. Livingston observer
Fort William.	63·1	−0·1	+0·1	—	+0·1	−0·3	60	+0·4	
The Observatory, F.W.	63·9	+0·1	+0·1	—	0·0	−0·1	90	+0·5	
Fort Augustus	58·8	+0·1	+0·1	—	+0·1	−0·4	80	Uniform	
Glencarron-	55·7	0·0	−0·2	—	0·0	−0·2	100	+0·3	
Lairg - -	57·8	+0·2	+0·1	—	−0·3	0·0	70	+0·2	
Dunrobin -	60·0	−0·5	−0·4	—	—	−0·6	75	Uniform	Index of Max.
Wick - -	58·7	+0·5	+0·4	—	−0·3	—	60	Do.	T. lost.
Stornoway -	55·9	+0·5	+0·5	—	+0·7	−0·4	90	Do.	Min. T. was 4°
Nairn - -	54·5	+0·7	+0·6	+0·1	0·0	−0·1	90	Do.	out of order.
Gordon Cas	57·0	+0·1	+0·2	—	+0·5	+0·1	120	+0·7	
Aberdeen -	57·2	+0·2	+0·2	—	+0·1	+0·1	75	−0·2	
Braemar -	54·7	+0·4	+0·5	—	+0·2	0·0	90	+0·3	
Lednathie -	51·9	+0·2	0·0	—	+0·2	−0·1	100	Uniform	
Dundee -	52·6	+0·5	+0·4	—	+1·4	−0·3	60	Do.	
Callton Mor	59·6	+0·1	0·0	—	+0·8	−0·5	60	−0·3	
Rothesay -	56·0	0·0	0·0	—	+0·2	−0·4	65	Uniform	
Ardrossan -	54·7	+0·2	+0·3	—	−0·2	−0·2	80	−0·2	
Glasgow -	55·8	—	—	—	−0·2	−0·1	50	+0·2	
Clober -	55·7	−0·1	+0·1	—	+0·5	+0·1	75	Uniform	
Ochtertyre -	53·8	0·0	0·0	—	+0·1	0·0	70	Do.	
Hawick -	59·2	0·0	−0·1	—	−0·1	+1·0	80	+0·3	
Wolfelee -	53·0	−0·2	−0·2	—	+0·2	−0·5	120	−0·3	
Marchmont	53·4	−0·1	−0·1	—	0·0	−0·1	300	Uniform	Temp. practically uniform.
Edinburgh-	52·7	−0·1	0·0	—	0·0	0·0	85	Do.	
Leith - -	53·5	+0·2	+0·4	—	+0·2	−0·4	50	Do.	

HYGROMETERS.

I have to report very favourably regarding the care with which the wet-bulb thermometer is attended to at all the stations without exception. While inspecting the station at Rothesay the weather was dull and drizzling, the air being apparently filled with the fine drizzle, the dry and wet bulbs in the screen read exactly the same. This is the first occasion I have seen this correspondence to occur since it was begun, some years ago, to give special attention to the working of the hygrometer in the thermometer screen.

Laudale, August 7, 1890.—There has been some trouble at this station from the index portion of the column of the maximum thermometer being shaken from its position during high winds. Accordingly, since last inspection, four new wooden supports and four new wire stays have been added to the Stevenson screen, which is now very firmly fixed, and it is believed the index now retains its place in high winds.

The instruments were all in very good order, and the observations are carefully made.

Fort William, August 9th.—The instruments were in good order, and the observations are correctly made. It has been resolved that the observations at this station, inclusive of those recorded by barograph and thermograph, be continued for some time till a satisfactory comparison be made between them and the observations made at the new observatory.

The Observatory, Fort William, August 8–9.—This observatory has been equipped as a station of the First Order by the Meteorological Council, and as a station of the Second Order by the Scottish Meteorological Society. Both sets of observations are forwarded to the Meteorological Office.

The Stevenson screen, rain-gauge, and sunshine recorder are placed in an open situation over grass, on which the sun shines all day from one hour after sunrise to sunset in summer, and the whole day in winter. There are three rain-gauges, Beckley's, with its accompanying check gauge, and one of the type in use at the Ben Nevis Observatory.

The self-recording instruments furnished by the Council have been recently fitted up by Mr. Baker, of the Kew Observatory, and the regular observations commenced on July 14th.

Everything at the observatory was in excellent order, and the observations were made with the greatest care and punctuality.

The Abbey, Fort Augustus, August 11.—The instruments were all in excellent order and are particularly well attended to and observed by Father Cody, the new observer. The sun reaches the sunshine recorder all day, except when it is behind the mountains, which here form a very irregularly outlined horizon.

Glencarron, August 14.—All the instruments were in very good order, and are observed with scrupulous accuracy. A Richard's hygrograph has just been added to this station and is placed in the same Stevenson screen with the thermograph.

Lairg, August 14–15.—The thermometer screen has been furnished with a new stand, been repainted, and thoroughly repaired. A new rain-gauge has been sent since the date of inspection, viz., on October 8th. The instruments were otherwise in good order and are well observed.

Dunrobin, August 15.—The index of the maximum thermometer (Phillips') was inadvertently lost at the time of the inspection. A new thermometer was sometime after sent from Edinburgh. All the other instruments were in good order, and are carefully observed.

Wick, August 15.—The minimum thermometer was seriously out of order, a part of the spirit, about 4°·0, being lodged near the top of the tube. This was shaken down. On comparison with the standard, as it still read 0°·7 too low, it was ordered to be placed in a highly inclined position for some hours before being replaced in the screen, to allow time for the whole of the spirit to drain down. Subsequent readings show that it is now correct. The other instruments were in good order, and are very well observed.

Swanbister and Stenness, August 18.—At the time of Mr. Fortescue's removal from Swanbister, the instruments were handed over to Mr. W. Halcro, joiner, who had been one of the assistant observers. He made the observations regularly and forwarded them to Mr. Fortescue for entry on the monthly schedules. Here the temporary positions of the instruments were good, but the maximum thermometer had been

accidentally broken in the end of last year, of which no intimation was given. (A new one was forwarded on my return to Edinburgh in October.) Thereafter I drove to the station at Stenness, taking the barometer with me, and placing it in its new position, and arranged with Mr. Fortescue, who kindly accompanied me, and with Mr. Spence, the new observer, for the immediate removal of the rest of the instruments to Stenness, and the positions in which they were to be placed. The situation of Stenness is a very open one, and Mr. Spence is likely to prove a good intelligent observer.

Stornoway, August 20.—Particular attention was given to the omission from the daily telegram of July 25th of any notice of the rapid fall of the barometer and storm during the previous night, for which Mr. Forbes expressed great regret. He made no attempt to account for the neglect, but he is unable to understand how it did occur. I believe the effect will be to make him thoroughly alert in future against the recurrence of so serious an omission. The rain-gauge was slightly deformed, but it was made right. The glass measure was broken accidentally on the Saturday. What remains still measures 0·3 inch, and will be used till a new measure arrives. All the other instruments were in excellent order and are well observed

Nairn, August 22.—The instruments were all in good order and intelligently observed, and the telegrams made up with care and expertness. The new minimum thermometer was hung up and the old one packed in the box and ordered to be despatched to the Office.

Gordon Castle, August 23.—Mr. John Webster, who had observed nearly 40 years, died last Christmas, and has been succeeded by his son Charles as head gardener and observer. The instruments are well exposed and placed in the kitchen garden, and were all in excellent order, and observed with great care and accuracy.

Aberdeen, August 26.—Everything at this station is well attended to, and the observations are made with remarkable care and intelligence.

The same remark applies to the self-recording instruments of the observatory. At the time of the inspection the "drop" from the wet-bulb fell at the rate of one in a minute and a half. As at the Fort William Observatory, the rain-gauge, after being emptied, does not begin to register till 0·005 inch of rain has fallen. It was satisfactory to observe from an examination of the curves, as showing the state of efficiency of the anemometer, that changes of wind were quickly shown with such small velocities as a rate of from 2 to 3 miles an hour.

Braemar, August 27.—As indicated in last Report, a new set of instruments has been supplied by Her Majesty to this station to replace those in use since 1855, and the screen in which they are kept has been thoroughly repaired and painted. They are superior instruments, kept in excellent order, and are well observed by Mr. Aitken and his niece.

Lednathie, August 29.—Everything at this station was in very good order, and the observations are made with remarkable intelligence. The vane works well except during frost, but in all cases its indications are checked by observations of smoke, trees, &c. The station is well up the slope of the Lednathie Burn, a tributary of the Prosen. The situation in the valley gives necessarily an undue proportion of N.W. and S.E. winds.

Dundee, August 30.—The instruments here continue to be thoroughly well kept, and the observations accurately made.

Callton Mor, September 1.—The instruments were in very good order, and are observed with much care and intelligence by Mr. Russell and assistant. As the index of the maximum thermometer (Phillips') was too long, it has since the time of inspection been sent to Edinburgh for rectification. This station was established in 1855, with the same observer, and with substantially the same instruments throughout. The instruments are placed in a very open situation in the garden.

Rothesay, September 2.—A comparison of the minimum thermometer with the standard suggested an examination, when a minute portion of spirit (about 0°·3) was seen lodged at the top of the tube. This was rectified. With this exception, the instruments were all in thoroughly good order, and observed with great intelligence.

Ardrossan, October 1.—The rain-gauge and thermometer screen are repaired and repainted, both jobs being well and strongly done. All the instruments now are in good order, and the observations are made with considerable intelligence.

Glasgow Observatory, October 2.—Except the 5 inches rain-gauge which has been raised to 16 inches above the ground, all the instruments remained as they were at the time of last inspection; they were all in very good order.

Milngavie, October 3.—The instruments at this station were in good order, and are intelligently observed and attended to. The anemometer is in a good position on a knoll in a field about a quarter mile from the other instruments.

For the sake of securing uniformity with the other stations of the Office, a Stevenson's thermometer screen was recommended, and it was also recommended that the barometer be removed from the large thermometer screen to the office adjoining. These suggestions have since been carried out. Mr. Bertram is very desirous in establishing this station that everything be in accordance with the requirements of the Office; and doubtless in his hands the station will become a valuable addition to the system.

Ochtertyre, October 4.—Everything at this station was in excellent order, and the observations are made most intelligently.

Ladylaw, Hawick, October 14.—The instruments are very good, and the observations, which began at the New Year, are intelligently and accurately made.

Wolfelee, October 15.—Instructions were given to paint the Stevenson screen and the rain-gauge. As regards the other instruments, they are good, were in good order, and the observations made with great care. The observer showed a good deal of interest in the observations, and a strong desire to do all in his power to make them correctly.

Marchmont, October 18.—The instruments are all in excellent order, and the observations made with marked intelligence. Mr. Loney has a good assortment of additional instruments at this station.

Edinburgh, October 21.—In addition to the usual instruments, which are nearly all in duplicate, Mr. Moss has a Redier's barograph, a Richard's thermograph, a Robinson's anemometer, and a sunshine recorder. The whole of the instruments are in remarkably good order, well placed, and are observed with much intelligence and enthusiasm.

Leith, October 22.—The minimum thermometer was found with 1°·8 of the spirit lodged near the top of the tube, which the observer, under my direction, set right. This was discovered by the observer five

months ago, and since then the readings have been regularly increased by adding 1·5 degree. Otherwise the instruments were in very good order, and the observations very intelligently made. Since last inspection the thermometer screen and enclosure has been repaired in a very satisfactory manner.

Rosewell, October 23.—The instruments are all good, and are well protected in a railed-off grass plot. They are in good order, and are attended to and observed with great care and intelligence.

(Signed) ALEXANDER BUCHAN.

REPORT of INSPECTION—ENGLAND.

TELEGRAPHIC REPORTING STATIONS.

Scilly (*St. Mary's*), June 26 and 27. — Since the death of Mr. Thomas, which occurred in the early part of the year, and by which the Council have been deprived of an observer of long experience, Mr. A. Hicks has undertaken the charge of the instruments at this station. I have in previous years given him some instruction, and have recommended him as being probably the only man in the island at present capable of undertaking the work of observation. I found him to require further teaching as regards the reporting of important changes indicated by the self-registering aneroid, and also as to the setting of the verniers of the barometers, which he had lowered too much (the error thus caused having been about −·026 in.). He has also a slight personal error in reading both barometers and thermometers, which appeared to me to be constant and unimportant.

All the instruments at Scilly are in their old positions, and in good order, except that a part of the anemometer again required cleaning, and that the maximum thermometer is very difficult to set, and should therefore be exchanged for another. I think that the present observer's estimates of wind forces of "5" and upwards, will be found to be slightly lower, in the mean, than were the estimates made by Mr. Thomas.

Prawle Point, June 29. — I found the observer at this station, Mr. Hewitt, to read the instruments, as before, with accuracy; but some loss has been sustained by the departure of Mr. Mehegan. Mr. Hewitt will probably be himself removed from Prawle in a short time. Another of the men at this station, Mr. Macarthy, appeared to me to be an intelligent and careful observer. The station is an excellent one, but the frequent changes of *personnel*, common to all coastguard stations, naturally form an obstacle to perfection in the observations. The observers at the time of my visit showed some aptitude for cirrus observations; they had, however, failed to report important changes of weather occurring between the fixed hours of observation. The instruments were in good order, but the maximum reads somewhat low.

Hurst Castle, July 2.—The instruments at this station were found to be in a satisfactory condition. The reports of the barometer and of the highest temperature show, as in former years, occasional errors. These are certainly not due to any inability to read the instruments correctly on the part of Mr. Appleton, but he has a somewhat hasty and casual way both of handling the instruments and taking the readings, and this appears to be ineradicable. Both the winds and the state of the sea are, as I have previously remarked, affected by local causes at this station.

Dungeness, July 31.—Mr. Curnow has left this station, and the observations are chiefly conducted by Mr. Batten. Inaccuracies still appear to occur from time to time in the barometric reports; but in my presence the light-keepers, who, as formerly mentioned, take the readings in rotation, as they are on duty, certainly read the instruments well, and all those now at the lighthouse give me the impression of being sober and reliable men. The muslin of the wet-bulb had not been changed with sufficient frequency.

Yarmouth, August 2–3.—The instruments at this station are in good order; but the wet-bulb is not kept sufficiently clean. The tracings of the self-registering aneroid have for a long time been too thick, in consequence of Mr. Watson's having attempted to alter the working of the pen, in order, as he told me, to "prevent the jumpings" produced in its trace. I accidentally broke off the ink-holder altogether in opening the case, which has no hinge, and was unclamped on the right-hand side. The pen has since been repaired, and the aneroid tracings are now good.

Cambridge, August 4.—Mr. Todd was again absent from Cambridge on the day of my visit. The reports have occasionally arrived late from this station. In reply to a letter on this subject, I was informed by Mr. Todd that they were in each case handed in punctually at the telegraph office. The fault lay with the latter, and the reports now arrive punctually. The alterations made in the height of the anemometer appear to me to be very advantageous. The dome of the observatory used formerly to obstruct Southerly, and to a less extent Northerly winds, in a very appreciable degree, and the obstruction is now less serious.

The observatory is, however, considerably sheltered by trees, and, as will be noticed from the horizon-breaks in the altazimuth sketch, these trees cut off the sun's rays from the sunshine recorder in the mornings of the late autumn and the beginning of the year. The observer states that he considers that, upon the average, not more than 30 minutes are lost by reason of the trees.

I found the instruments to be all in good condition, except that there was some deposit on the wet bulb.

Loughborough, October 9.—The observer was absent until very shortly before I left the station. Both the barometer and all the thermometers were found to be perfectly correct, and all the instruments to be attended to, as usual, with the very greatest care.

York, October 12.—The barometric reports from this station have not appeared to be quite satisfactory, the errors being usually positive. Some of the mistakes may be due to the want of punctuality on the part of the observer, of which I have formerly complained. On the occasion of this visit, however, the observer, to my surprise, set the vernier as much as ·018 too high. On my calling his attention to the mistake, he immediately set the vernier correctly. The thermometers are very accurate, but the muslin of the wet-bulb is not changed as frequently as the atmosphere of York requires.

Shields.—I visited North Shields on October 13. The barometers were removed from the old post office buildings to the telephone room of the new buildings on February 21st, 1890. Here their position is excellent, possessing several advantages which were wanting in their former site. The height of the cisterns, obtained from the builder's plan, is 117 feet above mean sea level. The muslin of the hygrometer had not been changed on the Saturday before my Monday's visit, the day of

the week on which it is said to be usually changed. It was more foul than usual, and in the extremely smoky air of Shields a daily change would be requisite to ensure anything like freedom from dirt. The rain-gauge as previously reported, receives occasional injuries, the inhabitants of the houses round Dockwray Square, with a considerable number of children, having access to it. The instruments are otherwise in good order.

STATIONS SUPPLYING MONTHLY OR WEEKLY RETURNS.

Cirencester, July 3.—Professor Ohm was engaged during almost the whole of my visit, and I only obtained one or two minutes conversation with him between his lectures. The instruments are in good order. The thermometers are well mounted in an enclosure made for that purpose in the large vegetable garden on the north-west side of the College; their readings are very correct. The sunshine recorder is well mounted on the top of a large and firm stand, reached by a ladder, and its adjustments are correct. It will be seen by the altazimuth sketch, which I have sent to the Office, that sunshine is cut off during the summer solstice between 7.25 and 7.32 p.m., or thereabouts, by a dense and growing clump of trees. Trees must also slightly interfere with the sunshine in winter, both in the morning and afternoon. The instrument was shifted to its present position in the autumn of 1888. It previously occupied an excellent vantage ground at the summit of the College tower, which had to be relinquished at the orders of the Principal on account of mischief done by some of the students, who seem to have gained access to the tower.

Epsom, July 30.—The observer was absent throughout the afternoon. The assistant was unfamiliar with the proper mode of treating the wet-bulb during frost, and I gave instructions on this subject. He read the instruments correctly. The muslin round the wet-bulb was somewhat stiff with lime and copper salts. The max. read 0°·6, or with its usual correction 0°·4, too low. The observations show decided improvement at this useful station.

St. Leonards, August 1.—I regret to say that I have not changed my opinion that Mr. Colborne is not a painstaking observer. He was absent from home on the day of my visit. The thermometer screen in the Gensing gardens required repairs, and it is rather surprising that the instruments remain unbroken, considering that they are accessible to the public. As it is, the minimum had disappeared, and had been replaced by the grass thermometer, which was simply laid on the bottom of the screen. I could not obtain the corrections for the thermometers; as compared with my standards the wet-bulb required a correction of −0°·5.

The sunshine recorder, which has a good exposure at the Hastings reservoir, is attended to by the keeper of the reservoir. I could not obtain access to the instrument on the day of my visit this year.

Eastbourne, August 1.—The returns from this station continue to be satisfactory. The instruments are in excellent order. The observer attaches no muslin to the wet-bulb, but winds the wet thread of wick round the bulb. I think that it may be best to permit him to adhere to this custom.

From the altazimuth sketch which I took at the sunshine recorder it is evident that the evening sun is cut off, principally in winter, by the range of high land, the southern extremity of which forms Beachy Head. The instrument has in other respects a perfect exposure, and the cards are carefully attended to.

A new copper rain-gauge is greatly needed at this station, the old instrument being almost entirely worn out.

Market Rasen, Tealby Vicarage, October 10.—Since Mr. Jevons relinquished the observations at Market Rasen the instruments, with the exception of the rain-gauge, were removed by the Reverend S. Lewin to his house at Tealby, about four miles north-east of their former position. Mr. Lewin, who required some instruction in the work of observation, was necessarily absent during a considerable portion of my visit. Levelling from an O. S. mark, I found the barometer cistern to be 260·1 foot above M. S. L. The instrument, which is fastened into its wooden box, was not suspended in a satisfactory way. The thermometer screen requires some repair and repainting. I could find no convenient site for a rain-gauge.

That the observer will fill in the returns conscientiously and punctually to the best of his ability I have no doubt. Unfortunately not only are the instruments rather inconveniently placed (and there seems to be no chance of improving their position here), but the whole locality is so much obstructed by trees and buildings and characterised by such hilly and broken ground, that I hesitate to give an opinion as to its suitability, desirable as it is that some station should be found in this neighbourhood. I should recommend that a few months' trial of the station be made, rainfall reports being had if possible from Mr. Jevons.

I have sent a rough ground plan of the position of the instruments.

York, October 12th.—The instruments at the Museum Gardens are in good order, and the observer reads the thermometers with accuracy, though he appears to be careless with his barometer. The screen is too crowded with instruments, the difference between the readings of which, when the door is closed, well exemplifies the effect of raising or lowering a thermometer-bulb in a Stevenson's screen.

The sunshine recorder was well adjusted at the date of my visit. The question whether it should be removed from the Friends School at Bootham should, in my opinion, be definitely decided in the negative. Mr. Clarke is a most able scientific teacher. The exposure at Mr. Thompson's house would not, I think, be so good, although that at Bootham is rendered imperfect by the Minster tower, an immovable obstacle, and by chimneys. Further, although the wooden pedestal on which the instrument is erected is unsteady, the school authorities are not disposed to go to the expense of erecting anything more substantial, and although it is difficult to get the instrument thoroughly well attended to in the vacations, and in term time some carelessness may be expected in the boys who occasionally have the charge of it, it is to be remembered that much is to be gained by the keeping of scientific instruments at educational establishments.

While it is easy to estimate a small present loss due to occasional clumsy manipulation, it is difficult to set too high a value on the possible acquisition of a taste for meteorological observation at our schools, and at such institutions as Epsom College, Cirencester, Cooper's Hill, &c. And if I may here be permitted such a digression, I think that the downward percolation of science is so great, that one lecture at a public school is worth very many at a fishery station.

Seaham, October 13.—The barometer was moved October 11, 1889 (since last year's inspection), from its rather inconvenient position in Mr. Aird's house to a good site in the residence of Mr. Leith at the cemetery grounds. The observations are all taken by Mr. Leith, who seemed inclined to set the vernier of the barometer somewhat low, but is accurate and careful in his readings of the thermometers. All corrections and reductions are still made by Mr. Aird, with whom I had no

interview on the day of my visit, as he was absent at his new residence, about six miles from the station. As might perhaps be expected, some inaccuracies have been noticeable in the returns. The max. read 1° too low. The screen has been repaired and repainted. All the instruments were found to be in good order. The present level of the barometer cistern is given as 150 feet. I question whether this is not 1 or 2 feet too high.

Stokesay, October 17.—The barometric returns from this station have for a long period been questionable. All the instruments are usually read carefully, as I think, by Miss La Touche, but at times the readings are taken by some of Mr. La Touche's young pupils, and I think that the barometer may occasionally be handled with insufficient care. I dislodged a small bubble of air from the tube, but after this had been done the mercury appeared to stand ·027 too low. The thermometer screen is home-made and of peculiar but not unsatisfactory type. I requested that it should be repainted and have some slight necessary repairs. I also advised that the grass minimum, which is new, but out of order, should be exchanged for another instrument. A good solar radiation thermometer is in use here now. As I have formerly observed, the wind at this station is very greatly affected by the hills.

Sutton Coldfield, October 18.—Since my last inspection the thermometer screen and rain-gauge have been removed to the observer's garden, where they have a satisfactory position. The barometer, an instrument on the Fortin principle, is by Bailley, of Birmingham, and has no error throughout the scale. It has not been removed from its former position on the ground floor of the borough offices. All the instruments are in good order, and appear to be well attended to, but some inaccuracies and omissions have been observed in the returns. I think improvement may be expected.

I inspected the following FISHERY BAROMETER STATIONS, with rather disappointing results :—

Hull.—I examined the fishery barometer at noon of October 11th. The number of this instrument, which was supplied in 1853, is B.T. 17. The level of the cistern is 7 feet above M.S.L. I found the instrument (at 30·270) to have a somewhat large error, requiring the correction of +·074, but the tube to contain no air. The foreman at the Humber Dock is in charge of the instrument, which he reads fairly correctly, but does not understand. The readings are sent in daily to the principal dockmaster's office, but are, as I was told, made no further use of. I think that the instrument attracts but little attention, except from a stray loiterer at the docks.

Withernsea.—I had selected Saturday as the most convenient day for lecturing to the fishermen at this station, and had written to Mr. John Ward, who is in charge of the instrument, on the subject. On my arrival, however, I found that there are only ten fishermen here, all of whom had gone to a fair at Hull. The barometer, B.T. 76, which was supplied in 1863, is affixed to the outside wall of what was formerly Mr. Ward's shop. I examined the instrument at 3 p.m. of the 11th, and found it, with a reading of 30·179, to require a correction of +·017. The instrument, however, appeared to be free from air. The altitude of the cistern was given to me by Mr. Ward as 20 feet above M.S.L., but, having plenty of time, I levelled and found it to be 22·3 feet. I could not elicit from Mr. Ward any tokens of intelligence as to the use of the instrument, neither do I think that the fishermen at this desolate spot employ it much.

(Signed) W. CLEMENT LEY.

October 21, 1890.

STATION.	BARO-METER.	THERMOMETERS.															STATION.
			DRY BULB.		WET BULB.		MAXIMUM.		MINIMUM.		SPARE.		GRASS.				
NAME OF STATION.	Difference of Observer's from Inspector's Readings.	Temperature of Water.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Condition of Hygrometer.	General State of Station.	NAME OF STATION.
			°	°	°	°	°	°	°	°	°		°				
Cambridge	−·003	64	−0·1	—	0·0	—	−0·4	—	+0·5	—	—	—	—	—	B	A	*Cambridge.*
Cirencester	—	60	+0·1	—	0·0	—	−0·1	—	−0·1	—	—	—	0·0	—	B	A	Cirencester.
Dungeness	+·001	60	0·0	—	+0·1	—	0·0	—	−0·1	—	—	—	—	—	B	A	*Dungeness.*
Eastbourne	—	70	0·0	—	+0·1	—	+0·1	—	0·0	—	—	—	—	—	A	A	Eastbourne.
Epsom	−·002	57	−0·25	−0·1	−0·1	—	+0·6	+0·2	+0·4	—	—	—	+0·35	—	A	A	Epsom.
Hurst Castle	·000	59	−0·15	—	−0·25	—	−0·15	—	−0·3	—	—	—	—	—	A	A	*Hurst Castle.*
Loughborough	—	55	+0·05	—	0·0	—	0·0	—	+0·05	—	+0·05	—	—	—	A	A	*Loughborough.*
Market Rasen	−·002	53	+0·1	—	−0·1	—	−0·4	—	+0·7	—	+0·4	—	—	—	B	C	Market Rasen.
Prawle Point	−·002	58	−0·1	—	0·0	—	+0·2	—	+0·4	—	+0·1	—	—	—	A	A	*Prawle Point.*
St. Leonards	—	66	−0·2	—	−0·5	—	0·0	—	—	—	—	—	+0·4	—	B	C	St. Leonards.
Scilly	−·020	55	0·0	—	0·0	—	−0·7	—	+0·2	—	0·0	—	—	—	A	A	*Scilly.*
Seaham	−·002	55	0·0	—	0·0	—	+1·0	+0·5?	0·0	—	—	—	—	—	A	A	Seaham.
Shields	+·002	57	0·0	—	0·0	—	−0·2	—	+0·1	—	—	—	—	—	B	A	*Shields.*
Stokesay	+·001	52	+0·1	−0·1	−0·2	−0·4	−0·1	−0·3	+0·3	−0·3	—	—	—	—	A	B	Stokesay.
Sutton Coldfield	+·004	—	—	—	—	—	—	—	—	—	—	—	—	—	B	B	Sutton Coldfield.
Yarmouth	−·001	66	−0·35	—	−0·05	—	+0·15	—	+0·35	—	—	—	—	—	B	A	*Yarmouth.*
York	+·018	58	0·0	—	0·0	—	−0·2	—	+0·2	—	—	—	—	—	B	B	*York.*
York	+·018	58	0·0	—	0·0	—	+0·1	—	+0·4	—	—	—	—	—	B	B	York.

REPORT on INSPECTIONS of the SELF-RECORDING OBSERVATORIES and ANEMOGRAPH STATIONS.

(M.O. 2119.)

Stonyhurst Observatory was inspected on August 14, 1890.

The instruments were found in good order, the barograph lenses were cleaned, although found to be much discoloured with fungoid growth between them, and the clocks were oiled. The thermograph calls for no note, beyond the fact that the wet-bulb threads required to be replaced by new ones, which was done.

The anemograph was in want of cleaning and oiling; it was accordingly wiped and oil applied. The joints in the long shafts have very considerable play, but that could not be rectified without fitting new screws. The rain-gauge was in very good order, but the pencil in use seemed to be coarser than is usually employed.

The sunshine recorder was in good order.

At the time of the inspection the two senior assistants were absent on account of illness, and the routine work was being carried on by a lad under the superintendence of the Rev. W. Sidgreaves.

Comparisons of thermometers were made as follows, Kew Standard of reference, K.S. No. 682 being used:—

Corrections to	Dry, K.S. 619 - - - -	−0°·2
„	Wet, K.S. 382 - - - -	−0·5
„	Bar. Ther., K.S. 339 - - -	−0·5
„	Max., M.O. 439 - - -	−0·3
„	Min., B.T. 501 - - -	+0·3

Aberdeen Observatory, visited August 2, 1890.—All the instruments were found duly working in good order. Lenses, &c. were cleaned and clocks oiled. No repairs were required. Owing to inclement weather the anemograph could not be entirely dismounted, but the bearings were all examined, and being found in good order were freshly oiled throughout. The sunshine recorder examination is registered on the printed form. The comparison of the thermometers was made in pounded ice, the results being entered in appended table:—

Dry, K.S. 397 - - - - -	−0°·05
Wet, K.S. 395 - - - - -	−0·6
Max., M.O. 1,002 - - - - -	0·0
Min., 5,056 - - - - - -	−0·1
Bar. Std., K.O. 71,061 - - - -	−0·4

Glasgow, Observatory, visited August 18, 1890.—The barograph, thermograph, and rain-gauge were all found to be working in good order. The lenses were cleaned and clocks oiled. The thermometers were compared with the inspector's standard, with the result given in the appended table. The anemograph was cleaned and examined, all the bearings being found in good order and the shafts sound. A blade of one direction fan being loose, it was carefully soldered up and set right. The sunshine recorder was also examined. The corrections to the thermometers were found to be as follows:—

Dry Std., K.S. 550 - - - - -	−0°·1
Wet Std., K.S. 472 - - - - -	−0·3
Max., 58,846 - - - - -	+0·1
Min., 63,942 - - - - -	−0·1
Bar. Ther. - - - - - -	−0·7

Swanbister, Orkney, visited August 25, 1890.—Mr. Fortescue having removed from this station to a house in Kirkwall, the care of the anemograph, together with the sunshine recorder, had been delegated to a young woman residing about a mile distant, and both instruments were found to have been maintained in thorough order. A new site for the instruments having been selected by Mr. Fortescue and approved by Mr. Buchan, on the hill above Stenness schools, where Mr. Spence, the schoolmaster, had undertaken the duties of observer, the anemograph, its hut and the sunshine recorder with its support, were dismounted and packed upon carts for removal. The next morning these were driven over the hills to the new site, where they were met by the inspector on arrival, with Mr. Fortescue, who kindly gave his assistance in the operation of re-erection. Mr. Spence was on the spot with the necessary workmen, and after marking the ground out with due regard to the proper orientation, foundations were dug and the necessary masonry built up to support the hut. This being done and the external parts of the anemograph being thoroughly cleaned, it was set up, approximately adjusted, and the instrument started by nightfall. The inspector and mechanic drove back to Kirkwall and returned next day, when the recording apparatus was taken to pieces and all, including the clock, thoroughly overhauled, cleaned, and oiled. Compass bearings were then taken of distant objects and the instrument properly adjusted, the observer instructed as to the working and care of it, and the anemograph fairly started in action.

The weather was very inclement and stormy, with heavy rain showers both days, with cloud, so rendering it impossible to adjust the sunshine recorder properly. This operation had therefore to be left in the hands of Mr. Spence, who was instructed how to perform it as soon as opportunity served. The exposure of the site is perfectly free and open on all sides, with the exception of slightly rising ground to the south, which, however, is insufficient to obstruct the solar rays at any time, or materially to influence the wind's force when blowing from that quarter.

The following are the bearings of landmarks from Stenness anemometer:—

N. corrected.—Western extremity of the headland of Ness and Harray and near farm of Brodgar.

E. and S.—Nil.

W. point.—Garden on farm of Marcequoi cairsto.

Fleetwood.—The anemograph at this station was inspected on August 11th–13th. The instrument was found working properly and well kept. Both shafts were taken out, and when cleaned of corrosion, small cracks were found in both shafts, which I had soldered up by a smith before replacing them. The direction fans were found free in their action, but their pitch is apparently coarser than in the case of other instruments, hence the diminished oscillation usually recorded. The loose blades on the fans were soldered up, and the nut on the clamping screw of the clock, which was found loose, was made tight. The orientation was examined and re-adjusted by a compass. At the request of Mr. Gaulter, I looked out a suitable spot for placing the sunshine recorder, should the town commissioners decide upon purchasing such an instrument. From the south side of the pavilion a perfectly clear horizon could be obtained for about 300° from NNE. to NNW.

North Shields.—Visited the high lighthouse to inspect the anemograph September 5th–6th. Found it working in good order; cleaned the whole thoroughly, and examined the shafts. These were not split,

but the Hook's joints appear somewhat slack. Oriented vane anew from sun's observation.

Yarmouth, September 11–12.—The anemograph at the Sailor's Home was thoroughly examined and cleaned, the shafts being also tested and found sound. A joint in the velocity shaft had worked loose and was screwed up tight. The clock was taken down, cleaned, and freshly oiled. The Hook's joints are all loose from wear. The orientation was tested by sun, and instructions given to Mr. Watson to set for N. about half a compass point further to the east than he had been in the habit of doing when checking the direction in future.

(Signed) G. M. WHIPPLE.

(M.O. 2120.)

Radcliffe Observatory, Oxford, October 1.—The whole of the instruments here were in a satisfactory condition and call for no special remark. The sunshine recorder is very well placed on the tower of the observatory about 100 feet above the ground, and has an uninterrupted exposure all the year through. Further details are given on the special form which accompanies this report.

A comparison of the various thermometers in use with the Kew standard thermometer No. 682 was made by me with the following results at 62° :—

Correction to standard dry bulb, No. 576 - -	−0°1
„ „ „ wet „ No. 575 - -	−0·2
„ „ maximum, M.O. 356 - - -	−0·5
„ „ minimum, M.O. 363 - - -	−0·1
„ „ barograph thermometer - -	−0·2

The instruments placed in the Stevenson's screen were also examined as follows at 62° :—

Correction to dry bulb, B.T. 1,710 - - -	−0°3
„ „ wet „ „ 1,709 - - -	−0·3

Holyhead, visited October 2–3.—At this station the anemograph was found in excellent working order, and as usual is well attended to. Unfortunately at the time of my visit the wind was blowing hard so that it was impracticable to dismount the exterior portions of the instrument.

The bearings, however, were examined and the orientation duly tested.

My attention was called to the unsatisfactory state of the clips which fasten the paper to the cylinder ; these were put right before leaving.

Mountjoy Barracks, October 4.—Here the anemograph was in want of cleaning, the oil in the direction bearing having become thick and hard. The instrument was accordingly dismounted, the external parts cleaned and fresh oil added. After re-mounting, the orientation was examined.

The clock was taken to pieces and cleaned.

Armagh, visited October 7–8.—On dismounting the anemometer at this observatory it was found that the oil in the direction bearing had become dry and hard. After cleaning all parts of the instrument the bearings were lubricated with mineral oil.

Dr. Dreyer called my attention to the pricker, which worked very stiffly; this was cleaned and set right.

The orientation was examined and found satisfactory.

As regards the rain-gauge the clock was taken to pieces, cleaned, and a new line attached to the weight.

Valencia Observatory, visited October 11–15.—The instruments here were all found to be in excellent order, and the anemometer well oiled and cared for.

The barograph and thermograph clocks were duly cleaned, and the lenses, condensers, and mirrors carefully wiped.

The various thermometers were compared with Kew standard thermometer No. 682, and found to require the following corrections, namely:—

Standard, dry bulb, No. 399	−0°·7
„ wet „ „ 398	−0·5
Maximum, M.O. 1,003	−0·1
Minimum, M.O. 2,497	−0·1
Barograph thermometer	−2·0
Standard barometer, attached thermometer No. K.O. 71,062	−0·1

The external parts of the anemometer were taken down and cleaned, after which all the bearings were lubricated by means of mineral oil. After cleaning the clock the orientation was tested as usual.

The rain-gauge clock was cleaned and the Stonyhurst discharger, which had been removed by Mr. Cullum (previous to my visit), was examined and re-adjusted, and after repeated trials was again fitted to the gauge.

Falmouth Observatory, visited October 20–24.—Everything was found to be working satisfactorily.

The usual cleaning of the barograph and thermograph clocks was duly performed, and the lenses and other parts attended to. A new line was attached to the barograph clock, On looking over the photographic traces, I noticed in the case of the thermograph sheet that it was slightly discoloured by stray light; this was rectified before leaving, and the zero lines shifted from the summer to the winter position.

The thermometers were compared with Kew standard 682, and found to have the following corrections at 62°, namely:—

Dry, Standard 383	−0°·6
Wet, „ 388	−0·3
Maximum, M.O. 104	−0·5
Minimum, M.O. 308	0·0
Barograph thermometer (no number)	−0·8
Standard barometer attached thermometer (no number)	−0·8

As regards the sunshine recorder, this instrument is placed on an iron support, which is fixed to the south railing on the roof of the observatory, the exposure being good all the year round. The adjustment for latitude was not quite right, the trace being a little too low on the card, but this was corrected by means of a wooden wedge.

The anemometer was completely dismounted and all parts cleaned, the bearings afterwards being lubricated with mineral oil.

Two blades of one of the direction vanes were found loose, but these I caused to be soldered tight before again erecting the instrument.

The clock was cleaned and the orientation tested.

The rain-gauge was examined and the clock cleaned.

(Signed) T. W. Baker.

APPENDIX IX.

Method of Dealing with Telegraphic Weather Intelligence.

The operations connected with the preparation and issue of the Forecasts and Storm Warnings have not undergone any material change. The Daily Weather Report also has not been altered in form during the year, but the average monthly values printed therein have been improved by the incorporation in them of the results for the five years 1886–90.

The Office receives, when the telegraphic communications are perfect, fifty-eight reports every morning, seventeen every afternoon (except on Sundays), and twenty-nine each evening, the arrangement of which is explained in the reports for recent years.

At the British and Irish stations the morning observations are taken at 8 a.m. Greenwich time, and most of the telegrams arrive in London at about 9 o'clock, when the Intelligence Department of the Post Office extracts from them the portions required for its wind and weather reports. They are then transmitted to the Meteorological Office by its private wire.

Daily Weather Report.

No important change has been made during the past year in the *form* of the Daily Weather Report, a detailed description of which is given in the Annual Report for 1887. The Report still fills four large quarto pages, and contains on page 1 the whole of the 58 reports from which the maps for the day (given on page 2) are prepared, and the 6 p.m. reports of the previous day, together with the maximum and minimum temperatures of the air, and the rainfall for the previous 24 hours.

On page 2 are two maps, showing (1) for 8 a.m. the distribution of pressure, the prevalent winds, and the sea disturbance, with necessary explanations: (2) the distribution of temperature at 8 a.m., the weather at each station, and the distribution of rainfall during the past 24 hours. Tables are added, giving the means of pressure, temperature, and rainfall as heretofore, but since January 1st the mean values employed have been improved, and are now—

For Pressure,	those for the	20	years 1871–90
„ Temperature	„	20	1871–90
„ Rainfall	„	25	1866–90

Page 3 contains (1) notes on the "General situation at 8 a.m.," and the "Probable changes in system now prevalent;" and (2) the forecasts drawn up at 11 a.m. for each district, relating to the weather likely to be experienced during the 24 hours ending at noon on the day succeeding that of publication; also an explanation of the meaning of the storm signals exhibited on our coasts.

Page 4 contains the observations made at 2 p.m. on the previous day, and "General Remarks on the Weather over Europe during the past 24 hours."

The standing portions of the report (maps, &c.) are printed in blue, while the information for each day is in black.

The subscription for the Report is —

For delivery by hand, where feasible,	£2	*per annum;*
Do. by book post	£1	„

MS. copies of the observations and remarks can be supplied at the rate of 2*l.* 10*s.* per annum. Arrangements can also be made for the supply of charts drawn from the 8h. a.m. or 6h. p.m. observations, such as appear in the "Times."

Correction and Addition List.

The following additional steps are taken to insure accuracy in the Daily Weather Report. Monthly returns are received, from nearly all of the telegraphic reporting stations, of all the observations which have been transmitted to London by wire. These are used for checking the daily telegrams, for the preparation of the average and other values of the different elements, and also as evidence in the case of legal proceedings. A lithographed sheet is issued each month with the Daily Weather Report, containing corrections for all discrepancies which have been discovered, and supplying any observations which have been omitted in the daily reports.

Weekly Weather Report.

The Weekly Weather Report, which has appeared since February 1878, was rearranged at the commencement of 1890, and is now prepared for the calendar week, Sunday to Saturday, in order to bring it into agreement with other weekly publications. This enables it to be published on Thursdays instead of Saturdays. The three daily synchronous maps which it contains (showing the outline of the land and sea) are printed in blue, while the information on them is in black. These maps show (1) for 8 a.m., the temperature, weather, and sea disturbance; and (2) for 8 a.m. and 6 p.m., the distribution of pressure and the winds, over, and on the coasts of, Europe. The information on the first and second pages of each report has been added to, as stated below.

The Summary on the first page contains the average and extreme temperatures, the rainfall values, and the total amount of bright sunshine in each week for twelve districts in Great Britain and Ireland, together with the difference between them and the respective mean values for the corresponding week in previous years. The district values for Accumulated Temperature, Rainfall, and Bright Sunshine are also given, both for the week and for the whole period since the beginning of the year. Two new columns have been added to this Summary, giving the differences between the amounts of sunshine recorded in the week, and corresponding averages in former years in addition to those previously published. The information is derived from observations made at 76 stations, the individual values for which are now given on the second page of the Report.

The tables of Accumulated Temperature are designed to give persons engaged in agriculture better means of estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer. They show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively, of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard, or *base temperature*. The base adopted is 42° F., as being nearly equivalent to 6° Cent. which has been considered by continental writers on these subjects to be the critical value, the temperature above which is mainly effectual in starting and maintaining the growth, and in completing the ripening of agricultural crops in a European climate. This base is also convenient as being 10° F. above the freezing point.

Accumulated Temperature is expressed in Day-degrees; a Day-degree signifying 1° F. of excess or defect of temperature above or below 42° F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours.

An explanation of these rules will be found in the last Annual Report, and full details as to the facts on which the rules are founded are published in Appendix II. to the Quarterly Weather Report for 1878.

The temperature means, derived from the daily maxima and minima, are corrected so as to agree as closely as possible with the true mean daily value, and the average values for the corresponding period in former years have been improved and added to, and are :—

For Temperature	-	20 years	1871–90
„ Accumulated Heat	-	10 „	1881–90
„ Rainfall	-	20 „	1866–85
„ Bright Sunshine	-	10 „	1881–90

The values for temperature, accumulated heat, rainfall, and sunshine for *each station** are given on the second page of each Report, and to this table also two columns have been added giving the difference between the current and average values for bright sunshine.

The Synchronous Charts referred to on page 16, with the daily Remarks thereon, occupy the third to sixth pages.

In addition to the reports from the Telegraphic Reporting Stations, and the returns from the self-recording Observatories, weekly schedules from 43 volunteer observers are used, the names of the stations and observers being as under :—

Names of Stations.	Names of Authorities.
Alnwick Castle	Lieut.-Col. F. Holland, for the Duke of Northumberland, K.G.
Arlington (N. Devon)	J. Carter, for Lady Chichester.
Bawtry (Hesley Hall)	B. I. Whitaker, J.P., F.R. Met. Soc.
Blackpool	J. Wolstenholme.
Braemar	J. A. Aitken, J.P.
Brookeborough	Mr. Fergusson, for Sir Victor Brooke, Bt., F.L.S.
Cheadle	J. C. Philips.
Churchstoke	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester	The Royal Agricultural College.
Cullompton	T. Turner, J.P., F.R. Met. Soc.
Douglas (Isle of Man)	A. W. Moore, M.A., J.P.
Dublin	J. W. Moore, M.D., F.R. Met. Soc.
Durham Observatory	H. J. Carpenter.
Edgeworthstown (Currygrane)	J. M. Wilson, J.P.
Fort Augustus	The late Rev. E. G. Cody and Rev. A. Weld-Blundell, O.S.B.
Foynes	W. Ward, for Lord Monteagle, K.P.
Geldeston	E. T. Dowson, F.R. Met. Soc.
Glencarron	D. D. Munro for Lord McLaren.
Glenlee	W. Melville for C. Maxwell.
Hastings (St. Leonard's)	H. Colborne, M.R.C.S.
Hereford	T. A. Chapman, M.D.
Hillington	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Kilkenny	H. Carlton, for the Marquis of Ormonde, K.P.
Killarney	The Ven. Archdeacon Wynne, F.R. Met. Soc.
Lairg	J. Young, Schoolmaster.
Laudale (Loch Sunart)	A. Fletcher, for T. H. G. Newton, M.A., F.R. Met. Soc.
Llandovery	J. Watkins, F.R. Met. Soc.
Llandudno	J. Nicol, M.D., F.R. Met. Soc.
Londonderry	J. Conroy, F.R. Met. Soc.
Marchmont	P. Loney for Sir Hugh P. Campbell, Bart.

* The sunshine values are furnished for only a limited number of carefully selected stations. See p. 66.

Names of Stations.	Names of Authorities.
Markree Castle (Co. Sligo) - -	A. Marth, F.R.A.S., for Colonel Cooper, F.R.A.S.
Newton Reigny (Penrith) - -	T. G. Benn, F.R. Met. Soc.
Ochtertyre - - - ♆	G. Croucher for Sir P. Keith Murray, Bart.
Oswaldkirk (sunshine only) - -	R. Thompson.
Plymouth - - - -	J. Merrifield, LL.D., F.R.A.S.
Prestwich (Manchester) - -	T. R. H. Clunn, M.D., F.R. Met. Soc.
Rothamsted - - -	Rainfall by Sir J. B. Lawes, Bart., LL.D., F.R.S., and J. H. Gilbert, Ph.D., F.R.S.; temperature by T. Wilson, F.R. Met. Soc.
Scarborough - - - ♅	W. Robinson.
Southampton - - -	J. T. Cook, R.E., Ordnance Survey Office.
Stamford (Ketton Hall)* - -	Fred. Coventry.
Stowell - - - ♅	Rev. H. J. Poole, F.R. Met. Soc.
Strathfield Turgiss - - ♅	Rev. C. H. Griffith.
Thurcaston (sunshine only) - -	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Waterford (Brook Lodge) - -	C. Percival Bolton, J.P.
Worksop (sunshine only) - -	H. Mellish, J.P., F.R. Met. Soc.

The returns marked "♅" are supplied through the Royal Meteorological Society, those marked "♆" are through the Scottish Meteorological Society.
* Added at beginning of 1891.

The MS. of the report is now prepared on Tuesday in every week, and the printed copies are ready for sale on Thursday afternoon, but the summary on its first page is sent to the "Times," "Daily News," and several other papers on Tuesday evening.

Appendices.

Appendices, four in number, have appeared, similar to those for recent years, and a supplement in the form of a Monthly Summary.

Monthly Summary.

This Supplement to the Weekly Report gives for each calendar month the mean and principal values for the different elements, Pressure, Temperature, Rainfall, and Sunshine, and the differences between these and the averages for the corresponding months in former years. The periods covered by the averages are the same as those used in preparing the Weekly Weather Report. See page .

There are also four maps, showing the distribution of Pressure, Wind, Temperature, and Rainfall, and the movements of the principal depressions observed during the month, and some brief notes as to the chief features exhibited. These have all been issued to the end of 1890.

Issue of Forecasts.

Remarks on the actual state of the weather, and forecasts *for not more than one day in advance*, are prepared at the Meteorological Office as under:—

On Week Days.

(1.) At 11 a.m. (from the morning reports), for the 24 hours ending at Noon on the day following the date of issue. These are intended especially for the early editions of the evening papers, for the clubs, and for exhibition at certain selected stations. See page .

afternoon reports), for the
is set of forecasts is not
ers, but a copy is exhibited
logical Office.

m., and 6 p.m. reports),
sue. These are supplied
gency which may apply for
. A very large number of
s agencies avail themselves

stricts :—

ORTH.
AST.
.E.
AST.
UNTIES.
OUTH.
WEST (with Isle of Man)
.W. (with North Wales).
.W. (with South Wales).
ORTH.
OUTH.

the doors of the Meteoro-
ek days,* for the inspection
, are communicated under
n which is not substantially

ront of the Office showing
and sea disturbance at six
sts. The stations selected
y, Holyhead, and Valencia
ose for 8 a.m. and 2 p.m.
g changed at about 9.45h.
sily read from the street.

n can be supplied with a
h week day,* on payment
n, or 2*s.* 6*d.* per official
e cost of transmission ; the
, by *book* post, 5*s.* 9*d.* per

for any of the hours men-
n daily, on payment of 3*d.*
the cost of telegraphy.

up at 11 a.m., for all the
bscription of ten shillings
nd, to Clubs situated in or
be made for delivery at a

* Bank Holidays are reckoned as Sundays.

FORECASTS FOR HAY AND CORN HARVESTS, OR FOR PUBLIC USE.—Special facilities are offered for the transmission of Forecasts for these purposes, a nominal fee of 2*s.* 6*d.* being charged for a quarter or any part thereof, in addition to the cost of the telegrams.

EXHIBITION OF TELEGRAPHIC FORECASTS AT LOCAL POST OFFICES.—The Post Office has sanctioned the exhibition of Forecasts at Local Post Offices, provided space is available, if the persons to whom they are addressed desire them to be so exhibited instead of being delivered.

Unless otherwise arranged, all forecasts transmitted by post are sent by book post, not as letters.

INQUIRIES as to the WEATHER.

INQUIRIES PERSONALLY OR BY MESSENGER.—Any person applying at the Meteorological Office between 11 a.m. and 8 p.m. on week days, and between 7 p.m. and 8 p.m. on Sundays, can be supplied, in writing, with the latest information in the possession of the Office and with the latest forecast issued for any specified district, on payment of one shilling for each inquiry.

INQUIRIES BY LETTER.—Application may be made by letter, enclosing thirteen pence in stamps if the reply is to be *by post*, and one shilling in stamps, in addition to the cost of the reply (consisting of ten words, exclusive of the address) if the reply is to be *by telegraph*.

INQUIRIES BY TELEGRAPH.—Any person may obtain *by telegraph* from the Meteorological Office the latest information as to the weather in any district of the United Kingdom by payment of a fee of 1*s.* in addition to the cost of a telegram and reply to any post office. The telegram containing the inquiry must be addressed as follows:

To

WEATHER,
LONDON.

The payment for the reply should be for at least ten words in addition to the address.

Application may also be made for similar information to be sent either *by telegraph* or *post* on some future specified day.

CHECKING of FORECASTS.

In order to test the accuracy of the forecasts they are compared carefully with the weather reported in the various districts on the days to which they referred, and the results of the checking for 8.30 p.m. are given in this Report (page 9).

In carrying out this comparison the portions of the forecasts which referred to wind have been carefully separated from those relating to weather. The detailed results of the comparison will be found in Appendix X., page 62.

CHECKING of STORM WARNINGS.

The testing of the warnings is still conducted in the manner indicated in earlier reports.

In order to render the information in the possession of the Office as to the weather experienced on our coasts still more complete, the Council

have, as in preceding years, made application to the various Light-house Boards, and have obtained from them the original log-books from some of the most exposed lightships and lighthouses. They would here express their cordial thanks for the co-operation so readily granted to them by these Boards.

The result of the checking for 1890 will be found on page 12.

In the course of the year improvements have been made both in the issue and checking of these storm warnings.

APPENDIX X.

REPORT ON THE COMPARISON OF THE FORECASTS ISSUED AT 8h. 30m. p.m. WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1889 to March 1890. The results are for the United Kingdom as a whole.

The letters used have the following signification :—

a = complete success. | **c** = partial failure.
b = partial (more than half) success. | **d** = total failure.

The checking has been conducted on the same system as that employed in previous years, *i.e.*, each forecast has been considered under the separate headings of "Wind" and "Weather," but the results of the 8.30 p.m. Forecasts only are here published.

The first column gives the per-centage of success in "Wind," the second in "Weather," and the third the average of the two.

The Summary for the whole year is given at page 9.

Months.		Per-centages.				Months.		Per-centages.			
		Wind.	Weather.	Average.	a + b.			Wind.	Weather.	Average.	a + b.
April	a	45	54	50	84	October	a	52	50	51	80
	b	35	34	34			b	27	31	29	
	c	16	7	12			c	16	13	15	
	d	4	5	4			d	5	6	5	
May	a	49	52	51	78	November	a	35	53	44	76
	b	31	24	27			b	31	33	32	
	c	12	11	12			c	27	8	18	
	d	8	13	10			d	7	6	6	
June	a	44	51	48	80	December	a	43	55	49	82
	b	36	28	32			b	37	29	33	
	c	12	12	12			c	15	7	11	
	d	8	9	8			d	5	9	7	
July	a	38	43	41	80	January	a	54	60	57	88
	b	37	42	39			b	34	27	31	
	c	15	9	12			c	8	5	6	
	d	10	6	8			d	4	8	6	
August	a	49	53	51	83	February	a	63	59	61	83
	b	29	34	32			b	19	25	22	
	c	15	9	12			c	13	5	9	
	d	7	4	5			d	5	11	8	
September	a	47	48	48	84	March	a	35	69	52	83
	b	35	38	36			b	42	19	32	
	c	15	9	12			c	19	8	13	
	d	8	5	4			d	4	4	4	

APPENDIX XI.

Telegraphic Weather Intelligence.

The following stations are supplied with telegraphic information of storms, free of expense, and signal "cones" have been furnished to most of them, all further expenses attendant on the maintenance and repair of the apparatus being borne locally. The stations are situated, 94 in England and Wales, 46 in Scotland, 20 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

NORTH.	WEST.	SOUTH.	EAST.
Scotland, N.E.	Ireland, S.W.	England, S.W.	England, E.
Lerwick.	New Ross.	St. Just.	Harwich.
Scalloway.	Dunmore East.	St. Sennen.	Ipswich.
Dunrossness.	Dungarvan.	Penzance.	Southwold.
Stromness.	Youghal.	Scilly.	Yarmouth.
Kirkwall.	Queenstown.	The Lizard.	Cromer.
Holborn Head.	Passage.	Falmouth.	Sheringham.
Dunnet Head.	Cork.	Pendennis.	Lynn.
Wick.	Kinsale.	Mevagissey.	Sutton Bridge.
Avoch.	Do. (Old Head)	Plymouth.	
Inverness.	Brow Head.	Devonport.	
Nairn.	Tralee.	Prawle Point.	
Burghead.	Limerick.	Teignmouth.	
Lossiemouth.	Galway.	Exmouth.	
Buckie.			
Port Knockie.	Ireland, N.W.		
Cullen.			
Portsoy.	Malin Head.		
Banff.	Portrush.		
Fraserburgh.	Port Ballintrae.	England, S.	
Peterhead.			England, N.E.
Aberdeen.	Irish Sea.	Guernsey.	
		St. Helier's (Jersey).	Boston.
	Belfast.	Gorey (Jersey).	Cleethorpes.
	Donaghadee.	Weymouth.	Grimsby.
	Howth.	Poole.	Goole.
	Kingstown.	Cowes.	Hull.
Scotland, E.	Ramsey (I. of M.).	Ryde.	BridlingtonQuay.
	Douglas "	St. Catherine's Point.	Filey.
Stonehaven.	Castletown "	Portsmouth.	Whitby.
Montrose.	Silloth.	Littlehampton.	Redcar.
Broughty Ferry.	Maryport.	Brighton.	Middlesborough.
Dundee.	Workington.	Newhaven.	West Hartlepool.
St. Andrews.	Whitehaven.		Sunderland.
Anstruther.	Barrow.		South Shields.
Pittenweem.	Morecambe.		Tynemouth.
Burntisland.	Fleetwood.		Berwick - on - Tweed.
Grangemouth.	Blackpool.		
Bo'ness.	Lytham.	England, S.E.	
Granton.	Southport.		
Newhaven.	Liverpool.	Hastings.	
Leith.	Runcorn.	Rye.	
Fisherrow.	Connah's Quay.	Sandgate.	
Dunbar.	Penmaenmawr.	Folkestone.	
Cockburnspath.	Port Penrhyn.	Dover.	
St. Abb's Head.	Port Dinorwic.	Margate.	
Eyemouth.	Carnarvon.	Faversham.	
	Holyhead.	Sheerness.	
		Chatham.	
	St. George's Channel.		
	Aberystwith.		
	Milford.		

[*continued.*

NORTH.	WEST.	SOUTH.	EAST.
Scotland, N.W.	Bristol Channel.		
Port of Ness (Island of Lewis).	Pembrey.		
	Llanelly.		
	Swansea.		
	Briton Ferry.		
	Porthcawl.		
	Penarth.		
	Cardiff.		
Scotland, W.	Do. Barry Dock.		
	Newport.		
Glasgow.	Weston-super-Mare.		
Greenock.	Burnham.		
Rothesay.	Bridgewater.		
Campbelton.	Ilfracombe.		
Girvan.	Barnstaple.		
Ballantrae.	Appledore.		
	Boscastle.		
	Port Isaac.		
	Newquay.		
	Hayle.		
	St. Ives.		

APPENDIX XII.

Fishery Barometers.

List of Places supplied with Fishery Barometers.

Shetland Isles.—Balta Sound, Uya Sound, Nesting, Lerwick, Sandsair, Scalloway, Symbister.

Orkney Isles.—Westray, Burra, Kirkwall.

Scotland, east coast.—Freswick, Auchengill, Keiss, Staxigoe, Wick, Sarclet, Lybster, Dunbeath, Portmahomack, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy, Whitehills, Gardenstown, Rosehearty, Pitullie, Fraserburgh, Inverallochy, Pointlaw, Findon, Portlethen, Skateraw, Stonehaven, Arbroath, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance, Burntisland, Newhaven.

England, east coast.—Berwick, North Shields, South Shields, Sunderland, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn (2), Wells, Gorleston, Harwich, Brightlingsea, West Mersea, Margate, Deal, Kingsdown, Dover.

England, south coast.—Bognor, Ryde, Bembridge, Brixton, Atherfield, Ventnor (2), Gorey (Jersey), Haslar Hospital, Poole, Weymouth, Portland, Budleigh Salterton, Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscath, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn, Mousehole.

England, south-west coast.—St. Ives, Hayle, Port Isaac, Boscastle, Burnham, Highbridge, Weston-super-Mare.

Wales.—Briton Ferry, Swansea, Angle, Milford, Nevin, Carnarvon.

England, north-west coast.—Fleetwood, Morecambe, Maryport.

Isle of Man.—Douglas, Port St. Mary, Peel (2).

Scotland, south-west coast.—Port Patrick, Stranraer.

Ireland, east coast.—Cushendall, Belfast, Bangor, Groomsport, Donaghadee, Ardglass, Warren Point, Carlingford, Greenore, Dundalk, Malahide, Howth, Kingstown (2), Bray, Wicklow.

Ireland, south coast.—Dunmore East, Dungarvan, Crosshaven, Kinsale, Union Hall, Castletownsend, Baltimore, Schull, Crookhaven.

Ireland, west coast.—Valencia, Dingle, Tralee, Tarbert, Kilcredane, Kilronan, Spiddal, Elly Bay, Ballyglass, Ballycastle (Co. Mayo), Donegal, Tribane, Killybegs, Teelin, Portnoo, Burton Port, Kincaslagh, Bunbeg.

Ireland, north coast.—Dunfanaghy, Rathmullen, Buncrana, Moville, Greencastle, Portstewart, Portrush, Ballycastle (Co. Antrim).

Scotland, west coast.—Tarbert (Loch Fyne), Campbeltown, Carradale, Portree (Isle of Skye), Plockton, East Mey, Stroma.

Hebrides.—Stornoway, Portnaguiran, Obb, Valtos, Carloway, Ness.

Summary of Stations supplied with Instruments.

England and Wales - - - - -	65
Scotland and Isle of Man - - - -	64
Ireland - - - - - -	51
	180

APPENDIX XIII.

LIST of STATIONS from which CONTINUOUS RECORDS of BRIGHT SUNSHINE have been received.

Station.	Observer.
Aberdeen Observatory	Prof. C. Niven, M.A., F.R.S.
Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S.
Blackpool	J. Wolstenholme.
Cambridge	H. Todd.
Churchstoke	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester	Prof. Ohm, B.A., F.R. Met. Soc.
Cronkbourne, Isle of Man	A. W. Moore, M.A., J.P.
Cullompton	Thos. Turner, J.P., F.R. Met. Soc.
Dublin, Mountjoy Observatory	Major Kirkwood, R.E.
Durham	H. J. Carpenter.
Eastbourne	R. Sheward, F.R. Met. Soc.
Falmouth Observatory	E. Kitto, F.R. Met. Soc.; for the R. Cornwall Polytechnic Soc.
Fort Augustus	(The late) Rev. E. G. Cody, O.S.B., and Rev. A. Weld-Blundell, O.S.B.
Fort William	R. T. Omond, F.R.S.E.; for the Scottish Meteorological Society.
Geldeston, Beccles	E. T. Dowson, F.R. Met. Soc.
Glasgow	Prof. R. Grant, M.A., LL.D., F.R.S.
Harpenden	T. Wilson, F.R. Met. Soc.
Hastings	H. Colborne, M.R.C.S.
Hillington	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Jersey (St. Helier's)	Capt. Bichard, Harbour Master.
Kew Observatory	G. M. Whipple, B.Sc., F.R.A.S.; for the Kew Committee.
Leicester (Thurcaston)	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Llandudno	J. Nicol, M.D., J.P., F.R. Met. Soc.
London, Bunhill Row	Messrs. de la Rue.
„ Westminster	The Staff, Meteorological Office.
Marchmont	P. Loney; for Sir Hugh P. Campbell, Bt.
Markree Castle	A. Marth, F.R.A.S.; for Col. E. H. Cooper, F.R.A.S.
Newton Reigny (Penrith)	T. G. Benn, F.R. Met. Soc.
Oswaldkirk, Yorkshire	R. Thompson.
Oxford	E. J. Stone, F.R.S.
Parsonstown	O. Boeddicker, Ph.D.; for the Earl of Rosse, K.P., F.R.S.
Plymouth	J. Merrifield, LL.D., F.R.A.S.
St. Ann's Head	S. Blake, Principal Lightkeeper.
Southampton	Sir C. Wilson, Col. R.E., K.C.B., F.R.S.
Stenness (Orkney)	M. Spence.
Stonyhurst	Rev. W. Sidgreaves, S.J.
Stornoway	John Forbes.
Sutton Coldfield	C. F. Marston, C.E.
Valencia	J. E. Cullum, F.R. Met. Soc.
Westgate-on-Sea	J. Norman Lockyer, F.R.S.
Worksop	H. Mellish, F.R. Met. Soc.
York	J. E. Clarke, B.A., B.Sc.
Georgetown, British Guiana	G. S. Jenman.

In addition, the number of hours sunshine recorded each day is reported from the following Stations :—

Arley Cottage (Co. Cavan)	Major Somerset H. Maxwell.
Edinburgh	R. C. Mossman, F.R. Met. Soc.
Braemar	James Aitken, J.P.
Stowell	Rev. H. J. Poole, F.R. Met. Soc.
Torquay	Alfred Chandler.

APPENDIX XIV.

METHODS FOLLOWED IN DEALING WITH METEOROLOGICAL RETURNS FROM LAND STATIONS IN THE BRITISH ISLES.

These stations are of five classes, as stated on page 15.

I.—*Observatories continuously observing all the Meteorological Elements.*

Returns from observatories.

Hourly measurements of the curves obtained from the self-recording instruments at the observatories of the Office are made by the observers at each station, on printed forms supplied for the purpose, which, together with the curves, are forwarded to the Office weekly. They comprise measurements of the barograms, of the dry bulb and wet-bulb thermograms, of the anemograms, and of the rain-gauge curves.

Examination of returns.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the revised regulations which have been adopted to secure this end will be found in the Report of the Office for 1890. They comprise rules for the guidance of observers, as well as of the assistants charged with the examination of the work at the Office. Attention need be called here to only two of these rules, viz., (*a*) the use of subsidiary sheets on which are entered the results of a second set of measurements of the curves made after, and quite independently of, the first set, and with a different form of scale, the two sets of measurements being afterwards compared together, and any differences found inquired into and set right; and (*b*) the re-measurements of the curve made by the assistants at the Meteorological Office, and which always amount to 40, and in doubtful cases to many more, per month, for each element.

Results of examination and report to Council.

The attention of the observers is always drawn to such errors as may be detected, and to any failures in the continuity of the curves arising from failure of the light, stoppage of the clock, defective photography, faulty action of the wet bulb thermometer, &c.; a report containing the results of the examination of each Observatory being also submitted to the Council periodically. The curves and tabulations are eventually bound and stored in the Office.

General supervision of observatory work.

In connexion with this work should be mentioned the general watch which has to be kept over the working of the observatories and of the instruments, not only to secure uniformity amongst them and observance of rules, but also to guard against small changes which are liable to occur at certain times, especially with the thermographs, and which may affect the scale-values of the instrument or the datum lines used for the tabulation of the curves. About twice a year this work calls for special examination, entailing some considerable time and occasionally the engraving of new scales for measuring the curves.

METHOD OF DEALING WITH THE NUMERICAL RESULTS FROM THE SELF-RECORDING OBSERVATORIES.

Interpolations.

In dealing with the tabulations the first step is to go over the sheets and fill up by interpolation, wherever possible, any gaps or breaks in the continuity of the record.

The records having been made as complete as possible, are then used for the calculation of daily and hourly mean values, for periods of five days, calendar months, and for the year; which, together with other data obtained from the same source, are published under the title of "Hourly Means of the Readings obtained from the Self-recording "Instruments at the Four Observatories under the Meteorological

" Council." The volume for 1887 has been issued during the year, and considerable progress has been made with the calculations for the year 1888.

Tables for the Quarterly Weather Reports. Gale tables.

The gale tables printed in the text of the Quarterly Weather Report, which show the extent, duration, and degree of severity of all the stronger gales, are prepared from the tabulations of the anemograms received from the self-recording observatories, together with those received from the extra anemographic stations.

II.—*Anemographic Stations at which the Wind is recorded continuously.*

The anemograms received from the stations enumerated on page 70 are regularly examined and tabulated in the Office, and the sheets bound up in volumes. Besides special inquiries on legal and other points that from time to time arise, and in which these documents are of high importance, the tabulations are always employed in the preparation of the summary of weather and gale tables for the Quarterly Weather Report. They are also regularly used in the checking of the Storm Warnings issued by the Office.

III.—*Land Stations of the Second Order.*

Origin and progress of system.

Ever since the year 1866 returns of more or less completeness have been received from land stations in the United Kingdom. In that year there was only one station, but by 1871 the number had increased to 15, and five years later to 49, including 14 stations belonging to the Royal Meteorological Society, copies of the returns from which were sent to the Office under a special arrangement with the Society.

At the end of the present year the total number of stations was 103, including 17 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society. This is an increase of 6 stations as compared with the previous year.

It must, however, be observed that while this number is exclusive of the self-recording observatories and of the anemographic stations, it includes several others from which only very scanty information is received.

The stations are distributed as follows: 45 in England, 5 in Wales, 28 in Scotland, and 25 in Ireland.

The methods followed with regard to the examination and publishing of these returns have been fully detailed in previous reports, and need not now be repeated. The changes introduced into the volume for 1886 have been continued in that for 1887. These refer to the barometer readings, which are now given at station-level instead of being reduced to the mean sea-level; and to the humidity, where the depression of wet-bulb is shown, the international forms A and B being modified accordingly.

The volume for 1887 contains returns from 66 stations.

Arrangements have been made under which it is hoped that the arrears of this publication will be rapidly reduced.

Reports from 11 of the Irish stations are regularly supplied to the Registrar-General for Ireland for his Weekly and Quarterly Returns.

New stations.

When an application for the adoption of a new station is received, a schedule is forwarded to the observer containing a series of questions as to the outfit of the station, the exposure of the instruments, and the influence likely to be exerted on their indications by surrounding objects, such as houses and trees. Only mercurial barometers are accepted, and only such as have been duly verified. All thermometers must have been

tested at Kew. A plan of the station, showing the positions of the instruments with regard to neighbouring objects, is also required.

On the return of this schedule the answers are considered, and, where necessary, alterations are advised.

If, however, the existing arrangements are satisfactory, tables for reducing the barometer readings to 32° Fahrenheit at mean sea level are prepared and duplicates sent to the observer, together with a set of Hygrometrical Tables, and a copy of "Instructions in the Use of Meteorological Instruments."

The first returns are compared and examined with special care, and a report of the result of the examination is forwarded to the observer, with instructions how best to improve and complete the returns.

There are still many parts of the British Islands very poorly represented by the existing stations, and any information for these districts would be valuable.

Sunshine records.

The daily records of sunshine which are now received from 42 Stations in the British Islands are examined generally to guard against accidental changes in the adjustment of the instruments. Notes explaining any omission or accidental defect are added to the cards if required, and after their receipt has been acknowledged, they are duly stamped and dated and then stored in the Office.

Weekly totals.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VIII., and for those stations which are also Stations of the Second Order the monthly totals of bright sunshine in hours, together with the per-centages of its possible duration, published as Part IV. of "Returns from Stations of the Second Order." A table showing the daily amount of sunshine at Bunhill Row, one of the London stations, is also prepared quarterly for the Royal Meteorological Society.

Inspection.

The Stations of the Second Order are regularly inspected, the attention of the inspector being directed by the Office to any special point which may require investigation.

IV.—*Telegraphic Reporting Stations.*

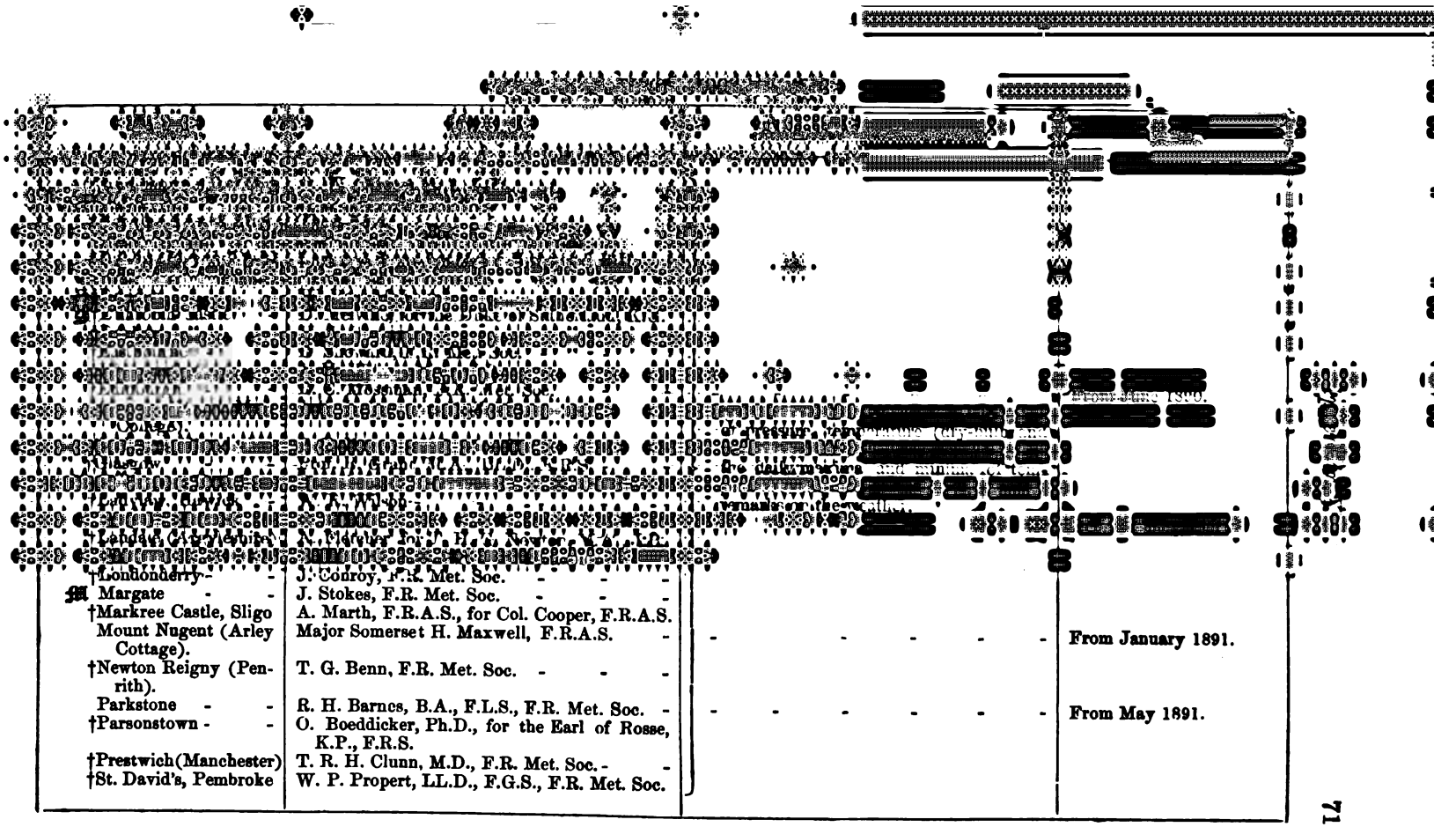
Full particulars relating to these stations, the information received from them, and the method of dealing with that information, will be found in Appendix VII. to the Report for the year 1888–9. A paragraph in that Appendix (p. 60) explains the use that is made of the monthly schedules sent in by the observers.

V.—*Extra Stations.*

No returns from Stations of the Fifth Class are published by the Office, but some of them are regularly used in the checking of the Storm Warnings, and all are available for any special investigation that may be taken up.

The rainfall values at these stations are, however, copied and supplied to Mr. Symons, F.R.S., for publication in "British Rainfall."

	†Scilly	A. Hicks	" "
	†Swanbister (Orkney)	W. Irvine Fortescue	" " Till August 25th.
	Stenness (Orkney)	M. Spence	" " From August 27th.
	†Yarmouth	G. T. Watson	" "
	†Kilkenny Castle	The Marquis of Ormonde, K.P.	Continuous record of pressure.
	London	The Athenæum Club	" "
	†Waterford	The Harbour Authorities	" "
Class III.	†Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S.	Regular observations at 9 a.m. and 9 p.m. of pressure, temperature (dry-bud and wet-bulb), wind, cloud and weather, with the daily maxima and minima of temperature, the daily rainfall, and general remarks on the weather.
	Aysgarth	Rev. Fenwick W. Stow, M.A., F.R. Met. Soc.	
	†Braemar	James Aitken, J.P.	
	†Brookeborough	W. Ferguson, for Sir Victor Brooke, Bt., F.L.S.	
	†Carmarthen	G. J. Hearder, M.D.	
	†Clober (Milngavie)	A. M. Bertram	From August 1890.



†Londonderry - -	J. Conroy, F.R. Met. Soc. - - -		
Margate - -	J. Stokes, F.R. Met. Soc. - - -		
†Markree Castle, Sligo	A. Marth, F.R.A.S., for Col. Cooper, F.R.A.S.		
Mount Nugent (Arley Cottage).	Major Somerset H. Maxwell, F.R.A.S. -	- - - - -	From January 1891.
†Newton Reigny (Penrith).	T. G. Benn, F.R. Met. Soc. - - -		
Parkstone - -	R. H. Barnes, B.A., F.L.S., F.R. Met. Soc. -	- - - - - -	From May 1891.
†Parsonstown - -	O. Boeddicker, Ph.D., for the Earl of Rosse, K.P., F.R.S.		
†Prestwich (Manchester)	T. R. H. Clunn, M.D., F.R. Met. Soc. - -		
†St. David's, Pembroke	W. P. Propert, LL.D., F.G.S., F.R. Met. Soc.		

☗†Buxton - -	E. J. Sykes, M.B., F.R.A.S., F.R. Met. Soc. -	Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m. each day as above.
☗†Callton Mor - -	J. Russell, for J. Malcolm of Poltalloch, M.P.	
☗ Cargen (Dumfries) -	P. Dudgeon, F.R.S.E., and Alex. Peacock -	
☗ Cheadle - -	J. C. Philips - - - -	
☗†Cheltenham - -	R. Tyrer, B.A., F.R. Met. Soc. - -	
☗†Churchstoke - -	P. Wright, F.C.S., F.R. Met. Soc. - -	
☗ Cramlington - -	W. Bonallo, F.R. Met. Soc. - - -	
☗†Fort Augustus -	The late Rev. E. G. Cody and Rev. A. Weld Blundell, O.S.B.	
☗†Fort William - -	C. Livingston, for Directors of Ben Nevis Observatory.	
☗†Glencarron - -	D. D. Munro, for Lord McLaren - -	
☗†Glenlee (Kirkcudbrightshire).	W. Melville, for George Maxwell - -	
☗†Gordon Castle -	J. Webster, for the Duke of Richmond, K.G. -	

Meteorological Council.

LIST OF DOCUMENTS—*continued.*

Stations.	Observers.	Nature of Information received.	Notes.
†Killarney - -	The Ven. Archdeacon G. R. Wynne, M.A., F.R. Met. Soc.	Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m. each day as above.	
†Lairg - -	J. Young, for The Duke of Sutherland, K.G. -		
†Lednathie (Forfarshire).	W. Morrison, for Stormonth Darling, Q.C. -		
†Lissan (Co. Tyrone) -	Sir Nathaniel Staples, Bart. - - -		
†Llandudno - -	J. Nicol, M.D., F.R. Met. Soc. - -		
†Marchmont - -	Peter Loney, for Sir Hugh P. Campbell, Bt. -		
†Ochtertyre - -	G. Croucher, for Sir Patrick Keith Murray, Bt.		
†Pinmore - -	Peter Donald, for Capt. Hamilton - -		
†Rosewell - -	R. W. D. Cameron, M.D. - - -		
†Rothesay (Isle of Bute)	James Kay - - - - -		
†Rousdon - -	C. E. Peek, M.A., F.R.A.S., F.R. Met. Soc. -		
Wakefield - -	H. Clarke, L.R.C.P., F.S.S., F.R. Met. Soc. -		
CLASS IV. The Telegraphic Stations, see List on page 36.			
CLASS V. Baltimore -	J. Halsey - - - - -	Pressure, temperature, wind, and weather, once daily.	
Bolton - -	W. W. Midgley, F.R. Met. Soc. - -	Full monthly summary.	
Bray (Co. Wicklow) -	Coast Guard - - - - -	Pressure and temperature four times daily, with wind and weather twice daily.	
Castletownsend -	Coast Guard - - - - -	Pressure and temperature four times daily, and wind twice daily.	
Chatham (School of Military Engineering).	L. M. S. Hall, for Instructor in Surveying -	Full return for 9 a.m.	
Cooper's Hill (Egham)	Prof. H. McLeod, F.R.S. - - -	Full return for 9 a.m. and 3 p.m.	
Crookhaven - -	Coast Guard - - - - -	Pressure and temperature four times daily, and wind twice daily.	
Crosshaven - -	J. W. Bridle - - - - -	Pressure, temperature, and wind, twice daily.	

LIST OF DOCUMENTS—*continued.*

Stations.	Observers.	Nature of Information received.	Notes.
Cuckfield - -	John Howe - - - - -	Daily rainfall.	
Ennis - -	J. Hill, M.I.C.E., F.R. Met. Soc. - -	Daily rainfall.	
Galway - -	Coast Guard - - - - -	Pressure and temperature four times daily, with wind.	
Gorleston -	R. J. C. Day - - - - -	Pressure and wind twice daily.	
Harpenden - -	T. Wilson, F.R. Met. Soc. - - -	Pressure, temperature, and wind, twice daily, with rainfall.	
Haslar Hospital -	G. Coppen - - - - -	Pressure and temperature four times daily.	July to December 1889.
Knightstown (Valencia).	Coast Guard - - - - -	Pressure, wind, and weather once daily.	
North Arran - -	Coast Guard - - - - -	Pressure, temperature of air and sea four times daily, with wind and weather at noon.	
Rosehearty - -	Coast Guard - - - - -	Pressure once daily.	
†Rugby - -	W. N. Wilson, M.A., and H. P. Highton, B.A.	Full set of 9 a.m. observations with 9 p.m. temperatures.	
†St. Leonards - -	H. Colborne, M.R.C.S. - - -	Full set of 9 a.m. observations.	
Schull - -	Coast Guard - - - - -	Pressure, temperature, and wind twice daily.	
Sheffield (Weston Park)	Elijah Howarth, F.R.A.S. - - -	Full return for 9 a.m. and 6 p.m.	
Stamford (Ketton Hall)	Fred. Coventry - - - -	Pressure, temperature (max., min., min. on grass), rainfall, and wind once daily.	
Stranraer -	P. Doran - - - - -	Pressure, wind, and weather once daily.	
Sudbury - -	W. Bayley Ransom - - - -	Pressure, temperature (dry-bulb, max., min.), wind, cloud, and rainfall, once daily, with general remarks.	
Symbister, Shetland -	J. S. Nicolson - - - -	Pressure and temperature twice daily.	
Tarbert, Harris -	Donald Bethune - - - -	Pressure and wind twice daily.	
Totland Bay - -	John Dover, B.A., F.R. Met. Soc. - -	Full return for 9 a.m.	
Union Hall (Glandore)	Coast Guard - - - - -	Pressure, temperature, and wind, twice daily.	

NOTE.—The Stations marked "℞" belong to the Royal Meteorological Society; those marked "♆" belong to the Scottish Meteorological Society; those marked thus † have been inspected during the year.

APPENDIX XVI.

Accessions to the Library during the Year ending 31st March 1891.

* **Abich, [W. H.]**—Meteorologische Beobachtungen in Transkaukasien. Lu le 12 avril 1850. la. 4°. (*Bull. Cl. Phys. Math. Acad. Imp. Sc. St. Petersb.*, ix.)‖

Adelaide Observatory.—Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the Northern Territory, under the direction of **C. Todd.** 1888, 1888. 2 vols. sm. f°. Adelaide, 1889–90. [1887, 1890.]

‖ **Agamennone, G.**—Il terremoto a Roma del 23 Febbraio, 1890 ed il sismometrografo Brassart. sm. f°. Roma, 1890. (*Ann. Uff. Centr. Meteor. e Geodinam.*, x., 1888, *Parte* iv.)

‖ ——— Sopra la correlazione dei terremoti con le perturbazioni magnetiche. la. 8°. Roma, 1890. (*Rend. R. Accad. Lincei*, vi., 1890, *p.* 21.)

‖ **Aguilar Santillán, R.** — Apuntes relativos á algunos observatorios é institutos meteorológicos de Europa. la. 8°. Mexico, 1889. (*Mem. Soc. Cient. Antonio Alzate*, iii., 1889, *No.* 1.)

——— Bibliografía meteorológica mexicana que comprende las publicaciones de meteorologia, fisica del globo y climatologia hechas hasta fines de 1889. la. 8°. México, 1890.

[Algiers, Service Météorologique du Gouvernement Général de l'Algérie.]—Bulletin météorologique de l'Algérie. 1890, Jan. 1—Dec. 31. oblong sm. f°. Sheets.

[Allahabad, Meteorological Office.]—Brief sketch of the meteorology of the North-Western Provinces and Oudh, and adjacent parts of Rájputana and the Panjáb. 1889. sm. f°. s.l.e.a.

* ‖ **Allen, W., and Woods, S.**—Barometrical measurements. 4°. London, 1817. (*Trans. Geol. Soc.*, iv.)

American Meteorological Journal.—A monthly review of meteorology, medical climatology, and geography. Edited by **M. W. Harrington, A. L. Rotch,** and **W. J. Herdman.** Vol. VI., 1889–1890. la. 8°. Ann Arbor, s.a.

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.—Tijdschrift . . . onder redactie van **C. M. Kan** en **J. Æ. C. A. Timmerman.** Tweede serie. Deel vii. 2 vols. 8°. Leiden, 1890.

* **Andrews, W.**—Famous frosts and frost fairs in Great Britain. Chronicled from the earliest to the present time. sm. 4°. London, 1887.

* **Arago, F.**—Œuvres de François Arago, publiées d'après son ordre sous la direction de **J.-A. Barral.** Memoires scientifiques, Tomes, i.–ii. 2 vols. 8°. Paris and Leipzig, 1858–59.

‖ **Augustin, F.**—Uber die Schwankungen des Wasserstandes in Moldau. la. 8°. (*Sitzungsb. k. böhm. Gesellsch. Wissensch.*, 1891, *p.* 50.)

Avignon, Commission Météorologique du Dépertement de Vaucluse.—Compte-rendu pour l'année 1889. sm. f°. s.l.e.a.

Azambuja, G. A. de.—Annuario da Provincia do Rio Grande do Sul para o anno de 1891. sm. 8°. Porto Alegre, 1890.

Baltá R. de Cela, J.—Observaciones efectuadas en la Estación Meteorológica de Vilafranca del Panadés durante el año 1890. 8°. Vilafranca, 1891.

Batavia, Magnetical and Meteorological Observatory.—Observations . . . Published . . . under the direction of **J. P. Van Der Stok.** Vol. xii., 1889. f°. Batavia, 1890.

Note.—Books marked * have been acquired by purchase; the others are donations from institutions, societies, or authors. Those marked ‖ are excerpt papers, extra copies of which have been separately printed.

In some cases additional publications have been received besides those specified, but only completed volumes or years are given here.

Batavia, Observatorium. — Regenwaarnemingen in Nederlandsch-Indië. Elfde Jaarg. 1889. Door **J. P. Van der Stok.** 8°. Batavia, 1890.

Title-page and Preface in the English language also.

Baxendell, J.—Abstracts of observations at the Southport meteorological observatory for the weeks ending Jan. 7, 1887–Jan. 2, 1891. Slips.

|| ——— Abstract of meteorological results for the Borough of Southport. Averages for the 18 years, 1872–89 inclusive. oblong 18°. Sheet. (*Southport Corporation Year Book for* 1890–91.)

* ——— On the relations between the decrement of temperature on ascending in the atmosphere, and other meteorological elements. Read . . . 1862. 8°. [*Mem. Lit. Phil. Soc. Manch., 3rd ser.*, ii., *p.* 132.]

* **Bebber, W. J. van.**—Die Wettervorhersage. Eine praktische Anleitung zur Wettervorhersage auf Grundlage der Zeitungswetterkarten und Zeitungswetterberichte für alle Berufsarten. la. 8°. Stuttgart, 1891.

Belize.—Summary of meteorological observations at St. Joseph's Observatory during the months of Jan.—Dec. 1890. 4°. Sheets. (*The Angelus, Belize*, 1890–91.)

|| **Berg, E.**—Über die Beobachtungen der Schneedecke im Europäischen Russland in der ersten Hälfte von 1890. Der Akademie vorgelegt am 20 Nov. 1890. sm. f°. St. Petersburg, 1891. (*Repert. Meteor.*, xiv., *No.* 5.)

|| **Bergmann, R.**—Über die Abweichungen der Temperaturen und Niederschlagsmengen im Europäischen Russland von ihren Normalwerthen während des Frühlings und Sommers 1890. Der Akad. vorgelegt am 20 Nov. 1890. la. 4°. St. Petersburg, 1891. (*Repert. Meteor.*, xiv., *No.* 6.)

Berlin, Deutsche meteorologische Gesellschaft.—Berliner Zweigverein der Deutschen meteorologischen Gesellschaft. Achtes Vereinsjahr, 1891. 8°. Berlin, 1891.

——— **Hydrographisches Amt des Reichs-Marine-Amts.**—Annalen der Hydrographie und maritimen Meteorologie. xviii., Jahrg. 1890. la. 8°. Berlin, s.a.

|| ——— **Königlich Preussisches meteorologisches Institut.**—Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1890, Jan.—Dec. la. 4°. (*Statist. Korresp.*)

Bezold, W. v.—Das königlich Preussische meteorologische Institut in Berlin und dessen Observatorium bei Potsdam. la. 8°. Berlin, 1890.

Bibliothèque Universelle [et Revue Suisse]. Archives des sciences physiques et naturelles.—Troisième période. Tomes xxiii.-xxiv. 2 vols. 8°. Genève, 1890.

* **Blyth, A. W.**—A manual of public health. 8°. London, 1890.

Bombay, Government Observatory.—Magnetical and meteorological observations made at the Government Observatory, Bombay, in the years 1888 and 1889, under the direction of **C. Chambers** and **F. Chambers**, together with appendices containing accounts of magnetic researches. f°. Bombay, 1890.

(——— ———) Report on the condition and proceedings of the Government Observatory, Colába, for the year which ended with the 30th June, 1890. f°. s.l.e.a.

[——— **Meteorological Office.**]—Brief sketch of the meteorology of the Bombay Presidency in 1888–90. 2 parts. f°. (Bombay, s.a.)

* **Bompas, Right Rev. W. C.**—Diocese of Mackenzie River. sm. 8°. London, 1888.

|| **Brezina, A.**—Die Meteoritensammlung des k.k. mineralogischen Hofkabinetes in Wien am 1. Mai 1885. la. 8°. Wien, 1885. (*Jahrb. k.k. geol. Reichsanstalt*, 1885, *Bd.* 35, *Heft* 1, *p.* 151.)

Brisbane, Chief Weather Bureau.—Special report on the floods of 1890, with notes on the meteorology of previous seasons. (By **C. L. Wragge.**) sm. f°. Brisbane, 1890.

——— **Government Meteorological Observer.**—Summary of meteorological observations taken at Brisbane. Jan. 1869 to June 1872, Jan. to Nov. 1875, July and Aug. 1880. oblong 8°. Sheets.

——— ——— Summaries of meteorological observations taken at Cape Moreton. Apl.—Dec. 1871, Jan.—Mch. 1875, Jan.—Mch. 1880. oblong 8°. Sheets.

Brisbane, Government Meteorological Observer.—Summaries of meteorological observations taken at Cooktown, during the months of January, February and March, 1880. oblong 8°. Sheet.

——— ——— Summaries of meteorological observations taken at Ravenswood. Aug. 1870—Mch. 1872. oblong 8°. Sheets.

——— ——— Summaries of meteorological observations taken at Somerset, Cape York. Aug.—Dec. 1869, Jan.—Mch. 1875. oblong 8°. Sheets.

——— ——— Summaries of meteorological observations taken at Sweer's Island, Gulf of Carpentaria. Jan. 1870—Dec. 1871. oblong 8°. Sheets.

——— ——— Summaries of meteorological observations taken at Toowoomba. Apl. 1871—Mch. 1872, Jan.—June 1875. oblong 8°. Sheets.

——— ——— Summaries of meteorological observations at Toowoomba and Warwick during the month of July 1869. oblong 8°. Sheet.

——— ——— Summaries of meteorological observations at Toowoomba, Warwick, and Cape Moreton. Aug. 1869—Mch. 1871. oblong 8°. Sheets.

——— ——— Summaries of meteorological observations taken at Warwick. April 1871—Mch. 1872. oblong 8°. Sheets.

——— ——— Table of rainfall. Feb. 1870—June 1872 and 1874. sm. f°. Sheets.

——— **Post and Telegraph Department, Chief Weather Bureau.**—The Queensland meteorological record. 1889, Jan.—Dec. f°. Sheets.
For Jan. and Feb. the title is "The climate of Queensland."

——— **Post and Telegraph Department, Meteorological Branch.**—Brisbane Observatory, Wickham Terrace. Meteorological synopsis. 1890, Jan.—Dec. f°. Sheets.

——— ——— Weather chart of Australasia. 1890, Jan. 1—Dec. 31. la. f°. Sheets.

British North Borneo Herald and Official Gazette. Vol. viii. 1890. Nos. 1–12. f°. Sandakan, 1890.
Contains meteorological observations.

Brussels, Observatoire Royal.—Bulletin météorologique. 1890, Jan. 1—Dec. 31. f°. Sheets.

‖ **Buchan, A.**—The meteorological results of the "Challenger" Expedition in relation to physical geography. la. 8°. (*Proc. R. Geogr. Soc.*, 1891, *Mch.*)

——— The meteorology of Ben Nevis. Forming Vol. xxxiv. of the Trans. R. Soc. Edinb. 4°. Edinburgh, 1890.

Bucharest, Academia Romana.—Analele. Seria ii. Tom. xi.-xii., 1889–90. 2 vols. 4°. Bucuresci, 1890.

Buenos Ayres, Oficina Meteorológica Argentina. Anales . . . por su Director **G. G. Davis.** Tomo vii. la. 4°. Buenos Aires, 1889.

(Calcutta, Meteorological Office, Bengal.)—Administration report of the Meteorological Reporter to the Government of Bengal for the years 1887–90. With summary of the meteorology of the year 1889. f°. s.l.e.a.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the weeks ending January 4, 1890, to January 3, 1891. f°.

——— ——— Meteorological and rainfall table of the Province of Bengal for the months of January to December 1890, with annual tables. sm. f°.

[——— ———] Bay of Bengal weather chart. 1890. Jan. 1—Dec. 31. sm. f°. Sheets.

——— ——— Bengal daily weather report. 1890. sm. f°. Sheets.
These reports are only published during the rainy season.

[——— ———] Summary of the meteorology of the year 1889. sm. f°. s.l.e.a.

Calcutta, Meteorological Office, India.—Abstract of the results of meteorological observations taken at the Alipore Observatory in the months of Jan.—Dec. 1890. sm. f°. Sheets.

——— ——— Abstract of the results of the barometric and thermometric observations taken at the Meteorological Office, Chowringhee. 1890, Jan.—Dec. sm. f°. Sheets.

——— ——— Cyclone memoirs. Part ii. Bay of Bengal cyclone of August 21st–28th, 1888. Published . . . under the direction of **J. Eliot.** la. 8°. Calcutta, 1890.

——— ——— Cyclone memoirs. Part iii. Bay of Bengal cyclone of September 18th–20th, and October 27th–31st, 1888, and Arabian Sea cyclone of November 6th–9th, 1888. Published . . . under the direction of **J. Eliot.** la. 8°. Calcutta, 1890.

[**Calcutta, Meteorological Office, India.**]—Hand-book of cyclonic storms in the Bay of Bengal. For the use of sailors. By **J. Eliot.** la. 8°. Calcutta, 1890.

[——— ———] India daily weather report. 1890, Jan. 1—Dec. 31. f°. Sheets.

[——— ———] Memorandum on the snowfall in the mountain districts of Northern India and Afghanistan and the abnormal features of the meteorology of India during the period January to May, 1890. f°. (Simla, 1890.)

[——— ———] Preliminary report on the meteorology for the year 1889, prepared in the Meteorological Office, Government of India. sm. f°. s.l.e.a.

[——— ———] Report on the administration of the Meteorological Department of the Government of India in 1889–90. f°. s.l.e.a.

[——— ———] Report on the meteorology of India in 1888. 14th year. By **J. Eliot.** f°. Calcutta, 1890.

——— ——— Results of the meteorological observations taken at the Alipore Observatory, from 5th January 1890 to 3rd January 1891. sm. f°. Sheets.

——— ——— Results of the barometrical and thermometrical observations taken at the Meteorological Office, Chowringhee, from 5th January 1890 to 3rd January 1891. sm. f°. Sheets.

Cambridge (Mass.), Astronomical Observatory of Harvard College.—Annals. Vol. xxii. Meteorological observations made on the summit of Pike's Peak, Colorado, . . . height, 14,134 feet, January, 1874, to June, 1888, under the direction of the Chief Signal Officer, U.S. Army. la. 4°. Cambridge, 1889.

‖ ——— **New England Meteorological Society.**—Bulletin of the New England Meteorological Society, in co-operation with the Astronomical Observatory of Harvard College and the United States Signal Service. Appendix for the year 1889. la. 4°. Cambridge, Mass., 1890. (*Ann. Astr. Obs. Harvard Coll.*, xxi., *Part* ii., *p.* 107.)

——— ——— Bulletin, 1890. Jan.—Dec. 4°. s.l.e.a.

‖ ——— ——— Investigations of the New England Meteorological Society for the year 1889. An investigation of the sea-breeze by **W. M. Davis, L. G. Schultz,** and **R. De C. Ward.** la. 4°. Cambridge, 1890. (*Ann. Astr. Obs. Harvard Coll.*, xxi., *Part* ii., *p.* 215.)

‖ ——— ——— [Report of the seventh annual meeting, referring specially to tornadoes.] la. 8°. (*Amer. Meteor. Journ.*, 1891, *Jan.*, *p.* 433.)

Cape Town, Meteorological Commission, Cape of Good Hope.—Report. 1889. sm. f°. Cape Town, 1890.

Carlsruhe, Centralbureau für Meteorologie und Hydrographie.—Deutsches meteorologisches Jahrbuch für 1889. Grossherzogthum Baden. Die Ergebnisse der meteorologischen Beobachtungen im Jahre 1889. Bearbeitet von . . . **Ch. Schultheiss.** la. 4°. Karlsruhe, 1890.

——— **Centralbureau für Meteorologie und Hydrographie im Grossherzogthum Baden.**—Uebersicht der Ergebnisse der an den badischen meteorologischen Stationen angestellten Beobachtungun, nebst Wasserstandsaufzeichnungen an den wichtigsten Hauptpegeln des Rheins. 1890, Jan.—Dec. f°. Sheets.

* ‖ **Carpenter, W. B.**—Summary of recent observations on ocean temperature, made in H.M.S. "Challenger" and U.S.S. "Tuscarora"; with their bearing on the doctrine of a general oceanic circulation sustained by difference of temperature. 8°. London, 1875. (*Proc. R. Geogr. Soc.*, xix., 1875.)

Carruthers, G. T.—The variation of the magnetic needle at Paris. 8°. Dated, West Brighton, 1891.

* ‖ **Celsius, A.**—Observationes quædam astronomicæ et meteorologicæ habitæ Upsaliæ anno 1739. sm. 4°. (*Mém. acad. sc., Sav. étrang.*, iv., *p.* 129.)

Christiania, Den Norske Nordhavs-Expedition. 1876–78. xix. Zoologi. Actinida ved **D. C. Danielssen.** f°. Christiania, 1890.
In the English language also.

——— ——— xx. Zoologi. Pycnogonidea. Ved **G. O. Sars.** f°. Christiania, 1891.
In the English language also.

——— **Norsk meteorologisk Institut.**—Oversigt over Luftens Temperatur og Nedbøren i Norge. 1888, 1889. 2 papers. 8°. s.l.e.a.

Christiania, Norwegisches Meteorologisches Institut.—Jahrbuch . . . für 1888. Herausgegeben von **H. Mohn.** sm. f°. Christiania, 1890.

* **Ciel et Terre.**—Revue populaire d'astronomie, de météorologie, et de physique du globe. xi^e^ année; 1890–91. 8°. Bruxelles, s.a.

‖ **Clark, J. E.**—The wind-rush at York, March 8th, 1890, with maps and aneroidograms. 8°. (*Nat. Hist. Journ.*, xiv., *p.* 137.)

* **Clements, H.**—The weather problem. Nos. i.–vi. 6 parts. 8°. (*Tinsley's Mag.*, 1890, *June—Nov.*)

——— The prediction of storms and the late great gale. sm. f°. 2 MS. sheets. Dated, Nov. 1890.

Coimbra, Observatorio meteorologico e magnetico da Universidade.—Observações meteorologicas . . . 1889. f°. Coimbra, 1890.

Colley, R., Michkine, N., et Kazine, M.—Observations actinométriques à l'observatoire météorologique de l'Académie Petrovsky près de Moscou. la. 8°. (Moscow), 1890.

In the Russian language with Résumé in French.

* **Collinson, R.**—Journal of H.M.S. "Enterprise," on the expedition in search of Sir John Franklin's ships by Behring Strait. 1850–55. By Capt. R. Collinson. With a memoir of his other services. Edited by his brother, Major-General T. B. Collinson. 8°. London, 1889.

‖ **Colombo, Surveyor General's Office.**—Report on the meteorology of Ceylon for 1889. By **F. C. H. Clarke.** sm. f°. (*Ceylon Administr. Rep.*, 1889, p. B 1.)

* **Cooper, A. J.**—How to forecast the weather months in advance. 8°. London, 1890.

Copenhagen, Dansk Meteorologisk Institut.—Bulletin météorologique du Nord, publié par les Instituts météorologiques de Norvége, de Danemark et de Suède. Année 1890. oblong 8°. Copenhague, s.a.

——— ——— Maanedsoversigt over Vejrforholdene. 1890, Jan.—Dec. f°.

——— **Kongelige Danske Videnskabernes Selskab.**—Oversigt over det . . . . Forhandlinger og dets Medlemmers Arbejder i Aaret 1889. la. 8°. Kjøbenhavn, 1889–90.

* **Copenhagen und Hamburg, Dänisches meteorologisches Institut und Deutsche Seewarte.**—Tägliche synoptische Wetterkarten für den nordatlantischen Ozean und die anliegenden Theile der Kontinente. v. Jahrg. Erstes—Viertes Quart., Dec. 1885—Nov. 1886. 4 vols. f°. Copenhague et Hambourg, 1889–90.

‖ **Cracow, C. K. Akademii Umiejętności w Krakowie.**—Materyjaly do klimatografii Galicyi zebrane przez sekcyję meteorologiczną komisyi fizyjograficznej. 1889. la. 8°. Kraków, 1890. (*Odbitek ze Sprawozd. Kom. fizyjogr.*)

——— **K. K. Sternwarte in Krakau.**—Meteorologische Beobachtungen. 1886–90. la. 8°. Krakau, 1891.

‖ **Crova, A.**—Rapport sur les expériences faites à Montpellier pendant l'année 1881 par la Commission des appareils solaires. 4°. Montpellier, 1882. (*Mém. Acad. Sc. etc. Montpellier, Sect. Sc.*, x., 1882.)

Croydon, Microscopical and Natural History Club.—[Daily rainfall at stations in Kent and Surrey.] 1890, Jan.—Dec. 4°. Sheets.

——— ——— Proceedings and Transactions. Feb. 1888 to Jan. 1889. 8°. Croydon, 1889.

Contains "Report of the meteorological sub-committee for 1888."

——— ——— Report of the meteorological sub-committee for 1889. 8°. [*Proc. and Trans. Croydon Microsc. Nat. Hist. Club*, 1889–90, *p.* 223.]

Contains rainfall observations only.

* **Cullimore, D. H.**—The book of climates. Acclimatization; climatic diseases; health resorts and mineral springs; sea sickness; sea voyages; and sea bathing. By D. H. Cullimore. Second edition, with a chapter on the climate of Africa as it affects Europeans, by Surgeon [**T. H.**] **Parke.** sm. 8°. London, 1891.

* **Davy, J.**—Observations sur les températures de l'océan et de l'atmosphère, et sur la densité de l'eau de mer, faites durant un voyage à Ceylan. Translated from Phil. Trans., 1817, Part 2. 8°. (*Annal. de Chimie*, vii., 1817, *p.* 49.)

|| **Decamps, L.**—La neige et les cartes du temps. 8°. (*Ciel et Terre*, 1891, *Janv.*, *p.* 521.)

|| **Denza, F.**—L'anticiclone del Novembre 1889. 4°. Roma, 1890. (*Atti Accad. Pont. Nuovi Lincei*, xliii., 1890.

|| ——— Le alte pressioni del Decembre 1889 e Gennaio 1890. 4°. Roma, 1890. (*Atti Accad. Pont. Nuovi Lincei*, xliii., 1890.)

|| ——— La inclinazione magnetica a Roma. 4°. Roma, 1890. (*Atti Accad. Pont. Nuovi Lincei*, xliii.)

|| **Devon.**—Reports of the Committee on the climate of Devon. Edited by **P. F. S. Amery** and **E. E. Glyde.** 1st to 8th (second series). 1881–1889. 8 vols. 8°. (*Trans. Devon Assoc. Adv. Sc.*, xiv.–xxii., 1882–90.)
1887 has been omitted.

* **Dodgson, H.**—Notes on the meteorology of Cockermouth. 8°. [*Trans. Cumberland Assoc. Advanc. Lit. Sc.*, ii., 1877, *p.* 41.]

Dublin, General Register Office.—Quarterly returns of the marriages, births, and deaths registered in . . . Ireland; . . . . 1890. 1st—4th quarters, Nos. 105–108. la. 8°. Dublin, 1890–91.

——— ——— Weekly returns of births and deaths in Dublin (including its suburban districts), and in fifteen of the principal urban sanitary districts in Ireland, 1890. la. 8°. Dublin, 1891.

* || **Dufour, L.**—Notes sur le problème de la variation du climat. 8°. (*Bull. Soc. Vaud. Sc. Nat.*, x., 1870, *p.* 359.)

* ——— Recherches sur la diffusion entre l'air sec et l'air humide à travers une cloison de terre poreuse. 8°. (*Bull. Soc. Vaud. Sc. Nat.*, xiii., *p.* 165.)

[Eberswalde, Hauptstation des forstlichen Versuchswesen in Preussen.]—Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von **A. Müttrich.** Sechzehnter Jahrg. 1890, Jan.—Dec. 8°. Berlin, s.a.

[——— ———] Jahresbericht über die Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von Dr. **A. Müttrich.** xv., Jahrg., 1889. 8°. Berlin, 1890.

Edinburgh, Royal Society.—Proceedings. Vols. xv.–xvi., 1887–89. 2 vols. 8°. Edinburgh, 1889–90.

|| **Ekholm, N.**—Ueber die Einwirkung der Ablenkenden Kraft der Erdrotation auf die Luftbewegung. 8°. Stockholm, 1890. (*K. Svenska Vet.-Akad. Handl.*, *Bd.* 15, *Afd.* i., *No.* 14.)

|| **Eliot, J.**—On the occasional inversion of the temperature relations between the hills and plains of northern India. Read Dec. 4, 1889. 8°. Calcutta, 1890. (*Journ. Asiat. Soc. Bengal*, lix., *Part* ii., 1890.)

Elliott, W. R.—Meteorological observations at Richmond Hill Observatory, Grenada. 1887, Feb. 4–17, 1888. 2 sheets. (*Cuttings from Gov. Gazette.*)

|| **Ellis, W.**—On the difference produced in the mean temperature derived from daily maximum and minimum readings, as depending on the time at which the thermometers are read. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvi., 1890, *p.* 213.)

——— On the relative prevalence of different winds at the Royal Observatory, Greenwich, 1841–1889. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvi., 1890, *p.* 221.)

——— On the diurnal variations of magnetic elements, as depending on the method of tabulation. 8°. (*Phil. Mag.*, 1891, *Jan.*, *p.* 36.)

Emden, Naturforschende Gesellschaft.—Jahresbericht . . . pro 1888–89 nebst Festschrift über die Feier ihres 75 jährigen Bestehens. 74. 8°. Emden, 1890.

England and Wales.—Map showing lines of equal magnetic declination for January 1, 1891. Suppl. to "Colliery Guardian," 1891, Jan. 2. f°. Sheet.

* **Everest, R.**—On the revolution of the seasons. 8°. [*Journ. Asiat. Soc. Bengal*, v., 1836, *p.* 281.]

Falmouth, Royal Cornwall Polytechnic Society.—Annual report. 57th. 1889. 8°. Falmouth, s.a.

Fineman, C. G.—Néphoscope marin. sm. 8°. (Upsala, 1890.)

|| **Fines, —.**—Des variations de l'électricité atmosphérique à Perpignan. la. 8°. Lille, 1890. (*Compt. rend. Congr. Météor. Internat.*)

|| ——— Influence de l'humidité sur le bifilaire magnétique et moyen de la corriger. la. 8°. Lille, 1890. (*Compt. rend. Congr. Météor. Internat.*)

|| ——— Revue climatologique, météorologique, agricole et sanitaire de l'année 1889 à Perpignan. 4°. [*Bull. Météor. Départ. Pyrénées-Orient.*, 1889, *p.* 83.]

* **Finley, J. P.**—Storm track, fog and ice charts of the North Atlantic Ocean, and hurricane track charts of the Gulf of Mexico. la. 4°. Boston, Mass., 1889.

Fitz Gerald, [G. F.], and Cullum, J. E.—Reports on the magnetic observations at Valentia. 8°. Dublin, 1889. (*Proc. R. Irish. Acad.*, 3*rd ser.*, i., *p.* 221.)

Fiume, K. K. Marine-Akademie.—Meteorologische Beobachtungen. 1890, Jan.—Dec., and Results. la. 8°. Sheets.

* **Folie, [F.]**—Petite climatologie de l'amateur et de l'agriculteur belges. sm. 8°. Bruxelles, 1886.

——— Sur la cause principale de la direction plongeante du vent et des calmes tropicaux. 8°. [*Bull. acad. sc. Belgique*, 3*me sér.*, viii., *p.* 759.]

Forstén, R.—Beiträge zur Kentniss der oberen Luftströme. 4°. Helsingfors, 1890.

|| **Fox, W. L.**—Meteorological tables for Falmouth and the Scilly Islands, for the year 1889, with notes. 8°. Falmouth, [1890.] (*Ann. Rep. Roy. Cornw. Polyt. Soc.*, 1889.)

Frankfurt am Main, Physikalischer Verein.—Jahresbericht . . . für das Rechnungsjahr 1888–89. 8°. Frankfurt a/M., 1890.

* || **Gadolin, A.**—Uber das Gesetz der Veränderlichkeit der Winde. Lu le 7 Nov. 1889. la. 4°. St. Pétersbourg, 1890. (*Mém. Acad. imp. sc. St. Pétersb.*, vii*e sér.*, xxxvii., *No.* 10.)

* **Garnier, J. G.**—Traité de météorologie, ou physique du Globe. 8°. Bruxelles, 1837.

Geneva, Société de Géographie.—Le Globe. Journal géographique. Tome xxix. la. 8°. Genève, 1890.

* **Glaisher, J.**—Comparison of the atmospheric pressure in Palestine and in England in the ten years ending 1889. 8°. (*Quart. Statement, Palestine Explor. Fund*, 1891, *Jan.*, *p.* 49.)

* ——— Meteorological observations at Sarona (near Jaffa, Syria). 1886–1889. 4 parts. 8°. (*Quart. Statement, Palestine Explor. Fund*, 1890, *Jan.*, *Apl.*, *July*, *Oct.*)

|| **Glyde, E. E.**—Abstract of meteorological observations made at Kirkham, Babbacombe, Torquay, during the year 1890. f°. Sheet. (*Torquay Directory.*)

González, B. G.—Ensayo de meteorognosia de la Ciudad de Puebla. 8°. Puebla, 1889.

Gratz, naturwissenschaftlicher Verein für Steiermark.—Mittheilungen. 1889. la. 8°. Graz, 1890.

Greenwich, Royal Observatory.—Report of the Astronomer Royal to the Board of Visitors . . . read . . . 1890, June 7. la. 4°. s.l.e.a.

——— ——— Results of the magnetical and meteorological observations made at the Royal Observatory, Greenwich, in the year 1888: under the direction of **W. H. M. Christie.** la. 4°. London, 1890.

Greenwood, W. N.—Kludonometric tide tables for the United Kingdom . . . 1891. sm. 8°. Lancaster, s.a.

——— Kludonometric pocket tide tables for the Lancashire Coast and Bristol Channel . . . 1891. sm. 8°. Lancaster, s.a.

|| **Habenicht, H.**—Die Ursachen der Cyklone des nordatlantischer Oceans. 8°. (*Zeitschr. Schul-Geogr.*, xi. *Jahrg.*, vi. *Heft.*)

* || **Haellstroem, G. G.**—Calculum observationum barometricarum, sympiezometricarum et thermometricarum, quas sub itinere circa tellurem instituit Nobil. v. Schantz, proponit G. G. Haellstroem. Lu le 21 juin, 1839. la. 4°. (*Mém. sav. étrang.*, iv., *p.* 273.)

|| **Hagström, K. L., and Falk, A.**—Mesures de nuages faites dans les montagnes de Jemtland pendant l'été de 1887. 8°. (*Öfversigt k. Vetensk.-Akad. Förhandl.*, 1891, *No.* 1, *p.* 3.)

|| **Haldane, J. S., and Pembrey, M. S.**—An improved method of determining moisture and carbonic acid in air. 8°. (*Phil. Mag.*, 1890, *Apl.*, *p.* 306.)

Halle, Kaiserliche leopoldino-carolinische deutsche Akademie der Naturforscher.—Leopoldina. Heft xxv. 1889. la. 4°. Halle, 1889.

Hamburg, Deutsche Seewarte.—Aus dem Archiv der Deutschen Seewarte. xii. Jahrg., 1889. la. 4°. Hamburg, 1890.

——— ——— Deutsches meteorologisches Jahrbuch für 1889. Beobachtungs-System der Deutschen Seewarte. Ergebnisse der meteorologischen Beobachtungen . . . Jahrg. xii. sm. f°. Hamburg, 1890.

——— ——— Deutsche ueberseeische meteorologische Beobachtungen. Heft iii. sm. f°. s.l.e.a.

——— ——— Monatsbericht der Deutschen Seewarte für jeden Monat des Jahres 1889. Jahrg. xiv. la. 8°. Hamburg, s.a.

——— ——— Resultate meteorologischer Beobachtungen von Deutschen und Holländischen Schiffen für Eingradfelder des nordatlantischen Ozeans. Quadrate 76, 149, Nos. viii.-ix. 2 vols. la. 4°. Hamburg, 1889–90.

——— ——— Vierteljahrs-Wetter-Rundschau an der Hand der täglichen synoptischen Wetterkarten für den nordatlantischen Ocean des Dänischen meteorologischen Instituts und der Deutschen Seewarte. Bd. ii. 1884–85. la. 8°. Berlin, 1889.

——— ——— Wetterbericht. Jahrg. xv. 1890, Jan. 1.—Dec. 31. f°. Sheets.

Hands and Co., A.—Illustrated catalogue of lightning conductors, vanes, finials, &c. 4°. London, s.a.

|| **Hann, J.**—Bemerkungen über die Temperatur in den Cyklonen und Anticyklonen. sm. f°. (*Meteor. Zeitschr.*, 1890, *Sept.*, *p.* 328.)

|| ——— Das Luftdruck-Maximum vom November 1889 in Mittel-Europa, nebst Bemerkungen über die Barometer-Maxima im Allgemeinen. la. 4°. Wien, 1890. (*Denkschr. math.-naturw. Cl. k. Akad. Wissensch.*, lvii., 1890, *p.* 401.)

|| ——— Das Luftdruckmaximum vom November 1889 in Mittel-Europa, nebst Bemerkungen über die Barometermaxima im Allgemeinen. la. 8°. (*Anz. k. Akad. Wissensch., Wien, Sitz. math.-naturw. Cl.*, 17 *Apl.* 1890.)

——— Die Veränderlichkeit der Temperatur in Österreich. la. 8°. (*K. Akad. Wissensch., Wien, Sitz. math.-naturw. Cl.*, 1890, *Dez.*, *p.* 252.)

——— **and Hellmann, G.**—Tägliche Periode der Monatsextreme des Barometerstandes. sm. f°. (*Meteor. Zeitschr.*, 1891, *Jan.*, *p.* 24.)

Hansa.—Zeitschrift für Seewesen. (Redigirt und herausgegeben von **W. von Freeden.**) xxvii. Jahrg., 1890. sm. f°. Hamburg, s.a.

|| **Harding, C.**—The cold period at the beginning of March, 1890. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvi., 1890, *p.* 152.)

* **(Harries, H.)**—The progress of weather study. la. 8°. (*Nat. Rev.*, 1890, *Sept.*, *p.* 26.)

* **Harris, W. S.**—Report on the working of Whewell and Osler's anemometers at Plymouth, for the years 1841, 1842, 1843. 8°. (*Rep. Brit. Assoc. adv. sc.*, 1844, *p.* 241.)

Havana, Real Colegio de Belen de la Compañia de Jesus.—Observaciones magnéticas y meteorológicas. 1887. f°. Habana, 1889.

Haviland, A.—Scarborough as a health resort: its physical geography, geology, climate, and vital statistics, with health guide map, &c. 8°. London, 1883.

|| **Hayden, E.**—The law of storms considered with special reference to the North Atlantic. Read before the Nat. Geogr. Soc., Nov. 15, 1889. la. 8°. (*Nat. Geogr. Mag., Washington*, ii., *No.* 3.)

|| **Hazen, H. A.**—Anemometer comparisons. 8°. (*Amer. Met. Journ.*, 1889, *Mch.*)

|| ——— Cloud formation. la. 8°. (*Amer. Meteor. Journ.*, 1889, *Sept.*)

|| **Hazen, H. A.**—Determination of "prevailing wind direction," la. 8°. (*Amer. Journ. Sc.*, xxxiv., 1887, *p.* 461.)

|| **[Hazen], H. A.**—Pressure and temperature in low and high. 8°. (*Amer. Meteor. Journ.*, 1887, *Oct.*)

|| **Hazen, H. A.**—Storms and a central ascending current. 8°. (*Amer. Met. Journ.*, 1889, *July.*)

|| ——— The relation between wind velocity and pressure. la. 8°. (*Amer. Journ. Sc., 3rd ser.*, xxxiv., 1887, *p.* 241.)

[Hazen], H. A.—Tornadoes. 8°. (*Amer. Met. Journ.*, 1887, *Aug.*)

* **Health Resorts,** home and foreign. Where to go for a healthy holiday, summer or winter. The holiday number of the London Medical Recorder, June, 1890. la. 8°. London, [1890].

|| **Hellmann, G.**—Die Regenverhältnisse vom 22 bis 24 November 1890 in Mittel- und Westdeutschland. la. 4°. (Berlin, s.a.) (*Centralblatt der Bauverwaltung*, 1891.)

——— Höhe der Schneedecke am letzten (31) Januar 1891 in Norddeutschland. f°. Berlin, 1891. (*Zweite Beilage Deutsch. Reichs-Anzeiger u. Königl. Preuss. Staats Anzeiger*, 1891, *Feb.* 9.)

Helsingfors, Finska Vetenskaps-Societeten. — Öfversigt af Finska Vetenskaps-Societetens Förhandlingar. xxxi. 1888–89. la. 8°. Helsingfors, 1889.

[Hermoso, F. L.]—Boletín meteorológico. Periódico quincenal. Dirigido por **Noherlesoom.** Año i. Nos. 5–12. la. 8°. Madrid, 1890.

* **Higgins, W. M.**—The earth, its physical condition and most remarkable phenomena. A new edition. sm. 4°. London, 1855.

* **Hildebrandsson, H. H., Koppen, W., und Neumayer, G.**—Wolken-Atlas. la. 4°. Hamburg, 1890.

In French, English and Swedish also.

* **Himmel und Erde.**—Illustrirte naturwissenschaftliche Monatsschrift. Herausgegeben von der **Gesellschaft Urania.** Redacteur: M. W. Meyer. ii. Jahrg. la. 8°. Berlin, 1890.

Hobart, Royal Society of Tasmania.—Papers and proceedings . . . for 1889. 8°. Hobart, 1890.

* **Holman, S. W.**—On the effect of temperature on the viscosity of air. Communicated May 13, 1885. la. 8°. (*Proc. Amer. acad. arts sc.*, xxi., *p.* 1.)

* || **Holyoke, E. A.**—A meteorological journal from the year 1786 to the year 1829, inclusive, by E. A. Holyoke. With a prefatory memoir by **E. Hale.** 4°. [*Mem. Amer. Acad. Sc., Boston, 2nd ser.*, i., 1833, *p.* 107.]

|| **Horn, F., und Tillmann, C.**—Beobachtungen über Gewitter in Bayern, Württemberg und Baden während des Jahres 1889. la. 4°. (*Beob. meteor. Stationen K. Bayern*, xi., 1889.)

|| ——— ——— Die Gewitter und Hagelschläge vom 21 September 1889. la. 4°. (*Beob. meteor. Stationen K. Bayern*, xi., 1889.)

* **Hornberger, R.**—Graphische Darstellungen für den meteorologischen Unterricht. la. f°. Cassel, 1890.

Ithaca, New York Meteorological Bureau.—Report. 1889, June—Dec. 1890, Jan.—Dec. la. 4°. s.l.e.a.

|| **Jamaica.**—Jamaica rainfall for the years 1887, 1888, 1889. f°. Kingston 1890. (*Suppl. Jamaica Gazette*, xiii., *n.s.*, 1890, *Nos.* 29–31.)

No. 122 of Jamaica Weather Report.

|| ——— Meteorological results for the ten years from June 1880 to May 1890, inclusive. f°. Kingston, 1890. (*Suppl. Jamaica Gazette*, xiii., *n.s.*, 1890, *No.* 32.)

No. 123 of Jamaica Weather Report.

|| ——— Weather report for the months of Jan.—Dec. 1890. sm. f°. Kingston, 1890–91. (*From the Jamaica Gazette.*)

Jenkins, B. G.—The British astronomical weather almanac, 1891. sm. 8°. London, [1890].

——— The British weather chart, 1891. oblong la. 8°. London, [1891].

* ——— The London weather chart. 1888–1890. oblong la. 8° and oblong 18°. 3 sheets. London, s.a.

|| **Juhlin, J.**—Sur la température nocturne de l'air à différentes hauteurs. Présenté à la Soc. Roy. Sc. d'Upsal le 27 Avr. 1889. 4°. Upsal, 1890. (*Nova Acta Reg. Soc. Sc., Ser.* iii.)

|| **Kammermann, A.**—Résumé météorologique de l'année 1889 pour Genève et le Grand Saint-Bernard. 8°. Genève, 1890. (*Arch. sc. phys. nat.*, 1890, *Sept.*)

|| **Kew Observatory.**—Report of the Kew Committee for the year ending October 31, 1890. 8°. London, 1890. (*Proc. R. Soc.*, 1890.)

Kiel, Ministerial-Kommission zur Untersuchung der Deutschen Meere.—Ergebnisse der Beobachtungsstationen an den deutschen Küsten über die physikalischen Eigenschaften der Ostsee und Nordsee und die Fischerei. Jahrg. 1889. Heft i.—xii. Oblong 8°. Berlin, s.a.

|| **Klossovsky, A.**—Différentes formes des grêlons observés au sud-ouest de la Russie. la. 8°. [*Mém. Soc. Nat. Nouvelle Russie, Odessa*, xv., *p.* 43.]

|| **Knipping, E.**—Der Wolkenbruch auf der Kü-Halbinsel, Japan, am 19 August 1889. sm. f°. (*Meteor. Zeitschr.*, 1890, *Aug.*, *p.* 281.)

|| ——— Veränderlichkeit der Tagestemperatur in Japan. sm. f°. (*Meteor. Zeitschr.* 1890, *Aug.*, *p.* 291.)

Krasno, agrarmeteorologisches Observatorium des Neutrathaler landwirtschaftlichen Vereines.—Der Laubfrosch. III. Jahrg., 1890. *vii.* Jahrg. der populären meteor. Abhandlungen . . . Redigirt durch **Frh. G. Friesenhof.** la. 4°. Alt-Krasno, 1890.

——— **agrarmeteorologisches Observatorium zu Alt-Krasno (vordem Nedanócz).**—Monatsberichte 1890 über die regelmässigen Beobachtungen. Jan.—Dez. la. 4°. Alt-Krasno, 1890.

——— **agrarmeteorologisches Observatorium des Neutrathaler landwirtschaftlichen Vereines.**—Wetterkalender für Ungarn. 1890. Jahrg. *vii.* Nos. 1–31. sm. 4°. Sheets.

Lagos, Colonial Surgeon.—Meteorological observations taken at the Colonial Hospital, Lagos. 1890, Jan.—Dec. f°. Sheets. (*Gov. Gazette*, 1890.)

Lahore, Meteorological Reporter to Government, Punjab.—Summary of meteorological conditions prevailing over the Punjab. 1890. Jan.—Dec. 4°. Sheets.

(——— **Sanitary Commissioner.**)—Report on the sanitary administration of the Punjab for the year 1889. f°. Lahore, 1890.

* **Laing, J.**—An account of a voyage to Spitzbergen; containing a full description of that country, of the Zoology of the North, and of the Shetland Isles; with an account of the whale fishery. With an appendix, containing some important observations on the variation of the compass, &c., by a Gentleman of the Navy. 8°. London, 1815.

* **Lake, W. C.**—A contribution to the comparative meteorology of Torquay, Teignmouth, and Sidmouth. Read . . . July, 1884. Sequel. Read . . . July, 1885. 2 papers. 8°. [*Trans. Devonsh. assoc. adv. sc.*, xvi., *p.* 627, xvii., *p.* 286.]

Lamprecht, G.—Wetter, Erdbeben, und Erdenringe. Beiträge zur astronomischen und physikalischen Begründung der Wetterkunde. 8°. Zittau, 1890.

|| **Lang, C.**—Beobachtungen der meteorologischen Stationen Bayerns und der Nachbargebiete am 19 Juni 1889 gelegentlich einer Ballonfahrt. la. 4°. (*Beob. meteor. Stationen. K. Bayern*, xi., 1889.)

|| (———) Bericht über die Thätigkeit der kgl. bayerischen meteorologischen Centralstation und der ihr angeschlossenen Stationen im Jahre 1889. la. 4°. (*Beob. meteor. Stationen K. Bayern*, xi., 1889.)

|| ——— Bühler's Hagelstatistik und vorläufige Mittheilung einer säkularen Periode der Hagel- und Blitz-Gefahr. sm. f°. (*Meteor. Zeitschr.*, 1891, *Jan.*, *p.* 6.)

|| ——— Die Fortpflanzungsgeschwindigkeit der Gewitter in Suddeutschland während des Jahres 1889 und Zusammenfassung der in den letzten elf Jahren gewonnenen Ergebnisse. la. 4°. (*Beob. meteor. Stationen K. Bayern*, xi., 1889.)

Latham, B.—Report on the sanitation of Bombay. la. 8°. London, 1890.

Lisbon, Observatorio Do Infante D. Luiz.—Annaes. xxv. 1887. f°. Lisboa, 1890.

——— ——— Boletim meteorologico. 1889, Jan. 1—Dec. 31. f°. Sheets.

Loanda, Observatorio Meteorologico.—Magnetismo terrestre. Declinação. 1881–88. sm. f°. Lisboa, 1890.

(Loefgren, A.)—Dados climatologicos [da Provincia de S. Paulo] dos annos de 1887 e 1888. 8°. S. Paulo, 1889. (*Bol. Comm. Geogr. e Geol., I., N.* 3.)

* **Lombard, H.-C.**—Les climats de montagnes considérés au point de vue médical. Seconde édition entièrement refondue. sm. 8°. Genève, 1858.

London, Army Medical Department.—Annual abstract of meteorological observations taken at Netley and foreign stations in the year 1888. la. 8°. (*Army Med. Dep. Rep.*, 1888, *App.* ix., *p.* 396.)

——— **Board of Trade.**—Abstracts of the returns made to the Board of Trade of shipping casualties . . . from the 1st July 1888 to the 30th June 1889 . . . with charts and appendices. sm. f°. London, 1890.

——— **British Association for the Advancement of Science.**—Report of the fifty-ninth meeting . . . held at Newcastle-upon-Tyne in September 1889. 8°. London, 1890.

——— **Decimal Association.**—Decimal coinage, weights and measures, popularly explained. By **Sir G. Molesworth** and **J. E. Dowson.** 8°. London, 1890.

——— **Edinburgh, and Dublin Philosophical Magazine** and Journal of Science. Fifth series. Vols. xxix.–xxx., 1890. 2 vols. 8°. London, s.a.

——— **General Register Office.**—Annual report of the Registrar-General of births, deaths, and marriages in England. 52nd. 1889. la. 8°. London, 1890.

——— ——— Quarterly returns of marriages, births and deaths registered in . . . England, Nos. 165–168, 1890. la. 8°. London, 1890–91.

——— ——— Weekly return of births and deaths in London and . . . other great towns. Vol. li., 1890. la. 8°. London, 1890.

——— **Meteorological Office.**—Daily weather report. 1890, Jan. 1—Dec. 31. 2 vols. la. 4°. s.l.e.a.

[——— ———] Instructions for keeping the meteorological log. fo. [London, 1890.]

——— ——— Meteorological observations made at Sanchez (Samaná Bay), St. Domingo, 1886–1888, by the late **W. Reid.** la. 4°. London, 1890.

——— ——— Meteorological observations at the foreign and colonial stations of the Royal Engineers and the Army Medical Department, 1852–1886. la. 4°. London, 1890.

——— ——— Meteorological observations at stations of the second order for the year 1886. la. 4°. London, 1890.

——— ——— The monthly weather report of the Meteorological Office for the year 1887. la. 4°. London, 1891.

——— ——— Report of the Meteorological Council to the Royal Society, for the year ending 31st of March 1890. la. 8°. London, 1890.

——— ——— The weekly weather report of the Meteorological Office for the year 1890 (vol. vii., third series), containing synoptic charts, and descriptive summaries of the weather for each day; also tabular summaries of temperature, rainfall, and bright sunshine, for each week. With monthly supplements and four appendices. la. 4°. London, 1891.

——— **Royal Astronomical Society.**—Memoirs. Vol. xlix., Part ii., 1887–89. 4°. London, 1890.

——— **Royal Botanic Society.**—Quarterly record. Vols. i.–iii., 1880–88. 3 vols. 8°. London, 1883–1889.

——— **Royal Geographical Society.**—Proceedings . . . and monthly record of geography. New monthly series. Vol. xii., 1890. la. 8°. London, 1890.

——— **Royal Meteorological Society.**—Catalogue of the library . . . compiled by **J. S. Harding, Jr.** Complete to September 1st, 1890. la. 8°. London, 1891.

——— ——— The meteorological record. Monthly results of observations made at the stations of the R. Meteor. Soc., with remarks on the weather for the year 1889. By **W. Marriott.** Vol. ix. la. 8°. London, 1890.

Contains also "Meteorology of England during the quarters ending March to December 1889." By **J. Glaisher.**

London, Royal Meteorological Society.—Quarterly Journal. Vol. xvi., 1890. la. 8°. London, 1890.

——— **Royal Society.**—Proceedings. Vols. xlvii.-xlviii., 1889-90. 2 vols. 8°. London, 1889-90.

——— **Society of Arts.**—Journal. Vol. xxxviii. From November 1889 to November 1890. la. 8°. London, 1890.

——— **Royal United Service Institution.**—Journal. Vol. xxxiv. 8°. London, 1890-91.

Lorenz-Liburnau, J. Ritter v.—Resultate forstlich-meteorologischer Beobachtungen insbesondere in den Jahren 1885–1887. Unter mitarbeit des K. K. Forst-Assistenten **F. Eckert.** I. Theil. la. 8°. Wien, 1890. (*Mittheil. forstl. Versuchsw. Österr., Heft* xii.)

* || **McAdie, A., and McRae, A. L.**—Atmospheric electricity. Communicated May 13, 1885. la. 8°. (*Proc. Amer. Acad. Sc.*, xx., *p.* 448.)

McLandsborough, J., and Preston, A. E.—Meteorology of Bradford for 1890. f°. Sheet.

(McPherson, J.)—Dew. 8°. (*Longman's Mag.*, 1890, *Oct.*, *p.* 667.)

Madrid, Observatorio.—Observaciones meteorológicas efectuadas en el Observatorio de Madrid durante los años 1888 y 1889. 8°. Madrid, 1890.

——— ——— Resumen de las observaciones meteorológicas efectuadas en la Peninsula y algunas de sus islas adyacentes durante el año de 1886. 8°. Madrid, 1890.

Magdeburg.—Jahrbuch der meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung. Herausgegeben von **A. W. Grützmacher.** Jahrg. viii., 1889. la. 4°. Magdeburg, 1890.

Manchester Literary and Philosophical Society.—Memoirs and Proceedings. 4th series, vol. iii. 8°. Manchester, 1890.

Manchester, Sheffield, and Lincolnshire Railway.—Monthly statement of rain fallen in the year ending 31st December, 1890. la. 4°. Sheet.

Manila, Observatorio Meteorologico.—Observaciones magnéticas verificadas por el **P. Martin Juan** en la Paragua, Joló y Mindanao. Año 1888. sm. f°. Manila, 1890.

* **Marchi, L. De.**—Climatologia. sm. 8°. Milano, 1890.

Marseilles, Commission de Météorologie du Département des Bouches-du-Rhone.—Bulletin annuel. Année 1889. 8me année. 4°. Marseille, 1890.

Mauritius, Royal Alfred Observatory.—Annual report of the Director . . . for the year 1888. f°. s.l.e.a.

|| ——— ——— Results of meteorological observations taken during the year 1889 at the Royal Alfred Observatory, Mauritius. sm. f°. (*Mauritius Blue Book*, 1889.)

Melbourne Observatory.—Monthly record of results of observations in meteorology, terrestrial magnetism, &c., &c., . . . 1889, Jan. — Dec. la. 8°. Melbourne, s.a.

——— ——— Report of the Board of Visitors to the observatory; together with the annual report of the Government Astronomer. 25th. sm. f°. Melbourne, 1890.

|| **Merrifield, J.**—Meteorological summary [for Plymouth] for the year 1890. oblong la. 8°. Sheet. (*Western Daily Mercury*, 1891, *Jan.* 5.)

Meteorologische Zeitschrift—Herausgegeben im Auftrage der **Oesterreichischen Gesellschaft für Meteorologie und der Deutschen meteorologischen Gesellschaft.** VII. Jahrg. (xxv. Bd. d. Zeitschr. oesterr. Gesellsch. Meteor.), 1890. la. 8°. Wien, s.a.

Mexico, Observatorio Meteorológico - Magnético Central. — Boletin mensual. Tomo II., 1889. la. 4°. México, 1889.

——— ——— Tablas psycrométricas calculadas para la altura de México. Tablas abreviadas generales compiladas por **J. Zendejas.** la. 8°. México, 1889.

——— **Sociedad Cientifica "Antonio Alzate."**—Memorias. Tom. i.-iii., 1887-90. 3 vols. 8°. México, 1886-89.

* **Meyer, H.**—Anleitung zur Bearbeitung meteorologischer Beobachtungen für die Klimatologie. 8°. Berlin, 1891.

* || **Michell, J.**—On the theory of free stream lines. la. 4°. London, 1890. (*Phil. Trans.*, clxxxi., 1890, *A.*, *p.* 389.)

Milan, R. Osservatorio Astronomico di Brera in Milano.—Osservazioni meteorologiche eseguite nell' anno 1889 col riassunto composto sulle medesime da **E. Pini.** sm. f°. s.l.e.a.

——— **R. Osservatorio astronomico di Brera.**—Pubblicazioni.
No. xxxvi. See **Rajna, M. e Porro, F.**
No. xxxvii. See **Pini, E.**

Monaco, Prince Albert de.—Experiénces de flottage sur les courants superficiels de l'atlantique nord. Congrès Internat. des Sc. Géogr. en 1889. la. 8°. Paris, 1890.

|| **Moureaux, T.**—Résumé des observations météorologiques faites par. M. Hervé Mangon à Brécourt (Manche), de 1868 à 1889. la. 4°. Paris, 1891. (*Ann. Bureau centr. météor. Fr.*, 1889, i.)
Contains also as an appendix—"Note sur la vitesse du vent à Paris, de 1861 à 1866."

Munich, K. [b.] meteorologische Centralstation.—Beobachtungen der meteorologischen Stationen im Königreich Bayern . . . xi. Jahrg., 1889. sm. f°. München, 1890.

——— ——— Uebersicht über die Witterungsverhältnisse im Königreiche Bayern. 1890, Jan.—Dec. la. f°. Sheets. (*Separat-Abdruck aus der "Augsburger-Abendzeitung."*)

——— ——— Wetterkarte und Wetterbericht. 1890, Jan. 1—Dec. 31. oblong fo. Sheets.

* **Murphy, P.**—Rudiments of the primary forces of gravity, magnetism, and electricity in their agency on the heavenly bodies. la. 8°. London, 1830.

* **Murray, J.**—Manuel de l'électricité atmosphérique, comprenant les instructions nécessaires pour établir les paratonnerres et les paragrêles, par John Murray, traduit de l'anglais, et augmenté de notes tirées de meilleurs auteurs par **A. Riffault.** 18°. Paris, 1831.

Müttrich, A.—Ueber den Einfluss des Waldes auf die periodischen Veränderungen der Lufttemperatur. la. 8°. (*Zeitschr. Forst- und Jagdwesen, Berlin*, 1890, *Juli.*)

Natal Harbour Board.—Chairman's Minute and Departmental reports for the year 1890. sm. f°. Durban, 1891.

* **Nature.**—A weekly illustrated journal of science. Vols. xli.-xlii. 1889-90. 2 vols. la. 8°. London and New York, 1890.

* **Nature, La.**—Revue des sciences et de leurs applications aux arts et à l'industrie. Journal hebdomadaire illustré. xviii^{e} année, 1890. 1er et 2^{e} Semestres. 2 vols. sm. f°. Paris, s.a.

* **Nautical Magazine** for 1890. New series. A journal of papers on subjects connected with maritime affairs. Vol. lix. 8°. London, s.a.

New York, American Geographical Society.—Journal. Vol. xxii., 1890. la. 8°. New York, s.a.

New York Meteorological Observatory.—Report. 1889. 4°. New York. 1889.

Nice, Société de Médecine et de Climatologie de Nice.—Nice-Médical. 14^{e} Année, 1889-90, Nos. 1-12. la. 8°. Nice, 1889-90.

Nipher, F. E.—The State Weather Service. Delivered by request of the State Board of Agric. . . Jan. 15. 1891. 8°. s.l.e.a.

Oviedo, Estación Meteorológica.—Resúmenes generales de las observaciones realizadas desde el año de 1851 hasta 1890 inclusive por **D. Luis G. Frades.** la. 8°. Oviedo, 1891.

Oxford, Radcliffe Observatory.—Results of meteorological observations made at the Radcliffe Observatory, Oxford, in the year 1886, under the superintendence of **E. J. Stone.** Vol. xliv. la. 8°. Oxford, 1890.

Paris.—Comptes rendus des séances de la première conférence générale des poids et mesures, réunie à Paris en 1889. la. 4°. Paris, 1890.

Paris, Académie des Sciences.—Comptes-Rendus hebdomadaires des séances. . . . Tomes cx.-cxi., 1890. 2 vols. 4°. Paris, 1890.

——— **Bureau Central Météorologique de France.**—Annales . . . publiées par **E. Mascart.** Année 1888, i.-iii. 3 vols. la. 4°. Paris, 1890.

——— ——— Bulletin international. xxxiv^e^. Année 1890. Jan. 1—Dec. 31. 4°.

——— **Comité International des Poids et Mesures.**—Procès-verbaux des séances de 1889. 8°. Paris, 1890.

——— ——— Treizième rapport aux Gouvernements Signataires de la Convention du Mètre sur l'exercice de 1889. sm. fo. Paris, 1890.

——— **Comité Météorologique International.**—Projet de tables internationales publiées conformément à une décision du Congrès de Rome. Tables météorologiques. Tables de conversion de mesures. la. 4°. Paris, 1887.

——— **Ministère de la Marine et des Colonies.**—Revue maritime et coloniale. Tomes civ.-cviii. 5 vols. la. 8°. Paris, 1890–91.

——— **Observatoire Municipal de Montsouris.**—Annuaire . . . pour l'an 1890. 18°. Paris, s.a.

——— **Service Hydrographique de la Marine.**—Annales hydrographiques. 2^e^ ser., Tome xi., 1889. la. 8°. Paris, 1889.

——— **Service Hydrométrique du Bassin de la Seine.**—Observations sur les cours d'eau et la pluie centralisées pendant l'année 1889 . . . 7 plates. f°. Versailles, s.a.

‖ ——— ——— Résumé des observations centralisées . . . pendant l'année 1889 . . . la. 8°. Versailles, 1890. (*Ann. soc. météor. Fr.*, xxxix., 1891, *janv.*)

——— **Société Météorologique de France.**—Annuaire. Tome xxxvii., 1889. la. 8°. Paris, s.a.

Peek, C. E.—Meteorological observations for the years 1884 and 1889. Rousdon Observatory, Devon. Vols. i. and vi. 2 vols. 4°. London, 1885, 1890.

Peking, Inspectorate General of Customs.—List of the Chinese lighthouses, light-vessels, buoys, and beacons for 1891. 19th issue. 4°. Shanghai, 1891.

——— ——— Medical reports, for the half-years ended 31st March and 30th September 1888. 35th and 36th issues. 2 vols. 4°. Shanghai, 1890.

(Perpignan, Commission Météorologique Départementale des Pyrénées-Orientales.)—Bulletin météorologique annuel . . . par le **Dr. Fines.** 1889. 4°. Perpignan, 1890.

Pesth, Königl. Ung. Central-Anstalt für Meteorologie und Erdmagnetismus.—Jahrbücher. xvii. Bd., 1887. la. 4°. Budapest, 1889.

In the Hungarian language also.

Petermann's (Dr. A.) Mitteilungen aus Justus Perthes' geographischer Anstalt. Herausgegeben von **A. Supan.** 36 Bd., 1890. 4°. Gotha, s.a.

——— aus Justus Perthes' geographischer Anstalt. Herausgegeben von **A. Supan.** Ergänzungsband xxi., 1889–90. 4°. Gotha, 1890.

Philadelphia, American Philosophical Society.—Proceedings of the American Philosophical Society held at Philadelphia for promoting useful knowledge. Vol. xxviii. 1890. la. 8°. Philadelphia, 1890.

——— **Franklin Institute.**—The journal of the Franklin Institute, devoted to science and the mechanic arts. Third series, vols. xcix.-c. 2 vols. 8°. Philadelphia, 1890.

* ——— ——— Index to the journal of the Franklin Institute (including the Franklin Journal) for the one hundred and twenty volumes from 1826 to 1885. Arranged according to subjects and authors. la. 8°. Philadelphia, 1890.

Pini, E.—Andamento annuale e diurno delle precipitazioni nel clima di Milano. Pubbl. R. Osserv. di Brera in Milano, N. xxxvii. sm. f°. Milano, 1890.

‖ **Plantamour, E.**—Résumé météorologique pour Genève et le Grand St. Bernard. 1848–1851, 1866–1869, 1871. 9 vols. 8°. Genève, 1849–52, 1867–72. (*Bibl. Univ. Genève*, 1849–52; *Arch. Sc. Bibl. Univ.*, 1867–72.)

Platzer, S. P.—Sulla straordinaria quantità di neve negli anni 1886 e 1888. 8° Udine, 1890.

Pola, hydrographisches Amt der k. k. Kriegsmarine.—Meteorologische und magnetische Beobachtungen. 1890, Jan.—Dec., and Results. Oblong la. 8°.

——— **K. K. hydrographisches Amt.**—Mittheilungen aus dem Gebiete des Seewesens. Jahrg. 1890. xviii. Band. la. 8°. Pola, 1890.

Contains also some unnumbered pages of meteorological observations recorded at Pola during 1889–90.

Pompei.—Le armonie della religione e della civiltà nella Nuova Pompei. Programma delle Feste di Maggio 1890. la. 8°. Valle di Pompei, 1890.

Contains Programme for the Inauguration of the "Osservatorio Meteorico-Geodinamico Vulcanologico."

Porto Rico, Jefatura de Obras Públicas de la Isla de Puerto Rico.—Resúmen de las observaciones meteorológicas verificadas. 1890. Jan.—Dec. 8°. Sheets.

Prague, Königlich Böhmische Gesellschaft der Wissenschaften.—Abhandlungen der mathematisch-naturwissenschaftlichen Classe . . . vom Jahre 1889–1890. vii. Folge, 3 Bd. 4°. Prag, 1890.

In the Hungarian language also.

Contains:—"Resultate d. ombrometrischen Beob. in Böhm. 1888."

See also **Prague, Techn. Bureau d. Landesculturrathes f. d. Königr. Böhm.**

——— **K. K. Sternwarte.**—Magnetische und meteorologische Beobachtungen . . . 1889. 50 Jahrg. la. 4°. Prag, 1890.

——— **Technisches Bureau des Landesculturrathes für das Königreich Böhmen.**—Ergebnisse der ombrometrischen Beobachtungen in Böhmen für das Jahr. 1889. 4°. Prag, 1890.

In the Hungarian language also.

See also **Prague, k. böhm. Gesellsch. der Wissensch.**

——— ——— Ergebnisse der Wasserstandsbeobachtungen an den Flüssen Bohmens für das Jahr. 1889. 4°. Prag, 1890.

In the Hungarian language also.

Prestoe, H.—Annual rainfall, 1862–1878. St. Ann's Observatory, County of St. George, Trinidad. sm. f°. Sheet.

Prince, C. L.—The summary of a meteorological journal kept by C. L. Prince at his observatory, Crowborough, Sussex. 1890. sm. f°. s.l.e.a.

Prior, R. C. A.—Coldest days of the last fifty winters. 8°. (*Quart. Record R. Bot. Soc.*, iv., 1890, *p.* 122.)

Puebla de Zaragoza.—Boletin de Estadistica del Estado de Puebla. Seccion de Meteorologia. Tomo I. Nos. 1–17. 1887–88. f°.

Puebla, Observatorio Meteorológico del Colegio del Estado de Puebla.—Resúmen correspondiente a cada dia. 1890, Jan.—Dec. sm. f°.

|| **Ragona, D.**—Eliofotometro del Reale Osservatorio di Modena. sm. f°. Torino, 1890. (*Boll. Mens. Soc. Meteor. Ital., Ser.* ii., ix., 1889, *No.* 11.)

|| ——— Influenza delle condizioni atmosferiche sull' influenza. sm. f°. Roma, 1890. (*Ann. Uff. Centr. Meteor. e Geodinam*, x., 1888, *Parte* i.)

|| ——— Relazioni tra i principali elementi meteorologici. sm. f°. Torino, 1890. (*Boll. Mens. Soc. Meteor. Ital., Ser.* ii., ix., 1889, *No.* 12.)

|| ——— Rivista meteorica della Provincia di Modena per l'anno 1889, con tre appendici. 1. Sui temporali di Luglio 1889.—2. Sulle grandi pioggie di Ottobre 1889.—3. Appunti sulla climatologia della Provincia di Modena. sm. f°. Modena, 1890. (*Mem. R. Accad. Sc. Lett. ed Arti Modena, Ser.* ii., viii., *Sez. di Sc., p.* 41.)

|| ——— Sui massimi e minimi barometrici nei mesi invernali. sm. f°. Torino, 1890. (*Boll. Mens. Soc. Meteor. Ital., Ser.* ii., x., 1890, *No.* 5.)

Rajna, M., e Porro, F.—Determinazione della differenza di longitudine tra gli osservatorii astronomici di Milano e di Torino mediante osservazioni fatte nel 1885. Pubbl. R. Osserv. Brera in Milano, No. xxxvi. sm. f°. Milano, 1890.

* **Raymond, G.**—Les grands centres d'action de l'atmosphère. Leur influence sur le temps d'après les recherches de M. Léon Teisserenc de Bort. sm. 8°. Paris, 1890.

* **Redway, J. W.**—Climate and the Gulf Stream. la. 8°. (*The Forum*, x., 1890, *Oct.*, *p.* 237.)

Richardson, J.—Daily tables (with averages) of the temperature and rainfall [at Faravohitra, Antananarivo), 1888, 1889. 2 parts. 8°. (*Antananarivo Ann. and Madagascar Mag.*, iii., 1888, *p.* 520; iv., 1889, *p.* 126.)

With MS. observations for 1887.

‖ **Riggenbach, A.**—Witterungs-Übersicht der Jahre 1888 und 1889, sowie neue Normal-Mittel für Niederschlag und Temperatur, nebst einem Anhang über Registrirbeobachtungen von Regen und Luftdruck. 8°. Basel, 1890. (*Verhandl. Naturf. Gesellsch. Basel*, ix., *Heft* 1.)

Riggenbach-Burckhardt, A.—Höhenmessung von Gewitter-Cumulus-Wolken. sm. f°. (*Meteor. Zeitschr.* 1891; *März*, *p.* 96.)

[———] Der Winter 1890–91. Newspaper cutting. (*Beilage zu Nr.* 75 *der Allg. Schweizer Zeitung, Basel*, 1 *April* 1891.)

Rijckevorsel, — van.—An attempt to compare the instruments for absolute magnetic measurements at different observatories. la. 4°. Amsterdam, 1890.

Rio de Janeiro, Imperial Observatorio.—Annaes . . . publicados por **L. Cruls.** Tomo iv. Partes i.–ii. 2 vols. sm. f°. Rio de Janeiro, 1889.

In the French language also.

——— ——— Annuario, 1888–89. Annos iv.–v. 2 vols. sm. 8°. Rio de Janeiro, 1888–89.

For continuation see **Observatorio Astronomico.**

——— **Observatorio Astronomico.**—Annuario. 1890. Anno vi. sm. 8°. Rio de Janeiro, 1890.

For previous years see **Imperial Observatorio.**

——— **Observatorio Meteorologico da Repartição dos Telegraphos do Brasil.**—Boletins mensaes. Vol. iii. 1888. 8°. Rio de Janeiro, s.a.

Riposto, Osservatorio Meteorologico del R. Istituto Nautico.—Bollettino mensile. Anno xvi., 1890. Fasc. 1–12. sm. f°. Riposto, 1890.

Rome, Ufficio Centrale Meteorologico e Geodinamico Italiano.—Bollettino meteorico. Anno xii., 1890, Jan. 1—Dec. 31. la. 4°. Sheets.

——— ——— Rivista Meteorico-Agraria. Anno xi., 1890, N. 1–36. la. 8°. (*Roma*, 1890–91.)

Roosenburg, L.—Cyclonen en de manoevres die er betrekking op hebben. la. 8°. Den Helder, s.a. (*Verslagen der Marine-Vereeniging, Jahrg.* 1890–91, *No.* 4, *p.* 109.)

Rugby School Natural History Society.—Report . . . for the year 1890. 8°. Rugby, 1891.

*‖ **Russell, F.**—Results of meteorological observations made at Akassa, Niger Territory, February 1887 to October 1888. la. 8°. (*Quart. Journ. Roy. Meteor. Soc.*, xv., 1889, *p.* 199.)

‖ **Rykatschew, —.**—Resultate der magnetischen Beobachtungen am Konstantinow'schen Mess-Institut in Moskau in den Jahren 1879–1888. sm. f°. St. Petersburg, 1890. (*Repert. Meteor.*, xiv., *No.* 1.)

St. Petersburg, Kaiserliche Akademie der Wissenschaften.—Repertorium für Meteorologie. . . . Redigirt von **H. Wild.** Bd. xiii. sm. f°. St. Petersburg, 1890.

——— **Observatoire Physique Météorologique.**—Bulletin météorologique. 1890, Jan. 1—Dec. 31. f°. Sheets

In the Russian language also.

——— **Ph sikalisches Central-Observatorium.**—Annalen . . . herausgegeben von . **Wild.** Jahrg. 1889. Theil i. und ii. 2 vols. sm. f°. St. Petersburg, 1890.

——— **Scientific Department of the Naval Technical Committee.** Naval Repertory. 1890, Nos. 1–12. Vols. ccxxxv.–ccxl. 6 vols. la. 8°. St. Petersburg, 1890.

In the Russian language.

San Fernando, Instituto y Observatorio de Marina.—Anales . . Publicados . . . por el Director Don **C. Pujazon.** Seccion 2ª. Observaciones meteorológicas. 1889. fº. San Fernando, 1890.

——— ——— Catálogo de la Biblioteca . . . en 31 de Diciembre de 1888. la. 8°. San Fernando, 1889.

Santiago, Observatorio Astronomico.—Observaciones meteorolójicas. 1885–1887. la 8°. Santiago de Chile, 1888.

* || **Schlagintweit, H. de.**—Numerical elements of Indian meteorology. First series.—Temperatures of the atmosphere, and isothermal lines of India. la. 4°. (*Phil. Trans.*, 1863, p. 525.)

* ——— **H., A., and R. de.**—General hypsometrical tableau of India and High-Asia. Part of Vol. ii. of results of a scientific mission to India and High-Asia. la. 4°. Leipzig, 1861.

|| **Schönrock, A.**—Specielle Untersuchung der Gewitter in Russland im Jahre 1888. la. 4°. (St. Petersburg), 1890. (*Repert. Meteor.*, xiii., *No.* 11.)

|| **Schoenrock, A.**—Untersuchung der Hochwasser in St. Petersburg, 1878–90. Der Akad. vorgelegt am 4 Dec. 1890. la. 4°. St. Petersburg, 1891. (*Repert. Meteor.*, xiv., *No.* 7.)

|| **Schück, A.**—Das Blatt der Kompassrose. 8°. (*Jahresb. geogr. Gesellsch., München*, 1890, *Heft* 13, *p.* 20.)

|| ——— Neuere Kompassrosen, ihre Entwicklung, Grundzüge und Prüfung für den Gebrauchswerth auf See. 2 papers. la. 8°. (*Zeitschr. für Instrument., Berlin*, 1890, *Juni*, *p.* 210; *Juli*, *p.* 256.)

(Scott, R. H.)—Thunderstorms. 8°. (*Longman's Mag.*, 1890, *June*, *p.* 192.)

|| ——— The variability of the temperature of the British Isles, 1869–1888, inclusive. 8°. (*Proc. R. Soc.*, xlvii., 1890.)

Seeland, F.—Magnetische und meteorologische Beobachtungen zu Klagenfurt. Dec. 1889—Nov. 1890 and year. 8°. s.l.e.a.

|| **Seemann, C. H.**—Wetterlexikon, ein Register zu den europäischen Wetterkarten von 1876–1885. 4°. Hamburg, 1890. (*Arch. Deutsch. Seewarte*, xiii., 1890, *No.* 4.)

Shortt, J.—Tasmania. Rainfall 1889. Map. fº. Hobart, s.a.

Singapore, Principal Civil Medical Officer, Straits Settlements.—Annual meteorological report, Straits Settlements, for the year 1889. sm. fº. s.l.e.a.

|| **Singer, K.**—Die Schneedecke in Bayern im Winter 1888–89, mit einem Anhang. Uebersicht über Dauer und Höhe der Schneedecke im Winter 1887–88. la. 4°. (*Beob. meteor. Stat. K. Bayern*, xi., 1889.)

——— Wolkennamen und Wolkenphotographie. 4°. Sheet. München, 1891.

Smithells, [A.]—Ozone. Lecture delivered at the Yorkshire College, Leeds. Newspaper cutting. (*Weekly Suppl. to Leeds Mercury*, 1891, *Feb.* 14.)

|| **(Snellen, M.)**—Buys Ballot. 8°. (*Nederl. Meteor. Jaarb.*, 1889.)

|| **Spoerer, G.**—Ueber die Periodicität der Sonnenflecken seit dem Jahre 1618, vornehmlich in Bezug auf die heliographische Breite derselben, und Nachweis einer erheblichen Störung dieser Periodicität während eines langen Zeitraumes. la. 4°. Halle, 1889. (*Nova Acta k. leop.-carol. deutsch. Akad. Naturf.*, liii., *Nr.* 2.)

|| **Sprung, A.**—Bericht über vergleichende Beobachtungen an verschiedenen Thermometer-Aufstellungen zu Gr. Lichterfelde bei Berlin. sm. fº. Berlin, 1890. (*Abhandl. K. Preuss. Meteor. Inst.*, *Bd.* i., *No.* 2, *p.* 35.)

|| ——— Ueber die Theorien des allgemeinen Windsystems der Erde, mit besonderer Rücksicht auf den Antipassat. sm. fº (*Meteor. Zeitschr.*, 1890, *Mai*, *p.* 161.)

|| ——— **und Fuess, R.**—Neue Registrirapparate für Regenfall und Wind, mit elektrischer Uebertragung. la. 8°. (*Zeitschr. Instrument., Berlin*, ix. *Jahrg.*, 1889, *p.* 90.)

|| **Sresnewskij, B.**—Über Schneeverwehungen auf den Eisenbahnen in Russland. Der Akad. vorgelegt am 5 Dec. 1889. sm. fº. (St. Petersburg), 1890. (*Repert. Meteor.*, xiii., *No.* 6.)

Stanley, W. F.—Surveying and levelling instruments . . . ; with other apparatus and appliances used by Civil Engineers and Surveyors. sm. fº. London, 1890.

(Stelling, E.)—Bemerkungen zu den meteorologischen Beobachtungen des Observatoriums in Irkutsk für das Jahr 1888. la. 4°. [*Annal. phys. Central-Obs. St. Petersb.*, 1888, *Theil* i.]

‖ ——— Magnetische Beobachtungen im Lena-Gebiet im Sommer 1888 und Bemerkungen über die säculare Änderung der erdmagnetischen Elemente daselbst. la. 4°. (St. Petersburg), 1889. (*Repert. Meteor.*, xiii., *No.* 4.)

Stockholm, Kongl. Svenska Vetenskaps-Akademie. — Meteorologiska iakttagelser i Sverige utgifna af kongl. Svenska Vetenskaps-Akademien, anstälda och utarbetade under inseende af meteorologiska Central-Anstalten. Bd. xxvii. 2dra Serien, Bd. 13. 1885. la. 4°. Stockholm, 1890.

In the French language also.

——— **Meteorologiska Central-Anstalt.**—Månadsöfversigt af väderleken i Sverige till landtbrukets tjenst utgifven under meteorologiska Central-Anstaltens inseende af Dr. **H. E. Hamberg.** Årgång x. 1890. f°. Stockholm, 1890.

Straits Settlements.—Annual report on the State of Negri Sembilan for the year 1889 by **M. Lister.** f°. Singapore, 1890.

——— ——— Annual report on the State of Perak for the year 1889. By **F. A. Swettenham.** sm. f°. Taiping, 1890.

——— ——— Annual report of the State of Selangor for the year 1889. By **W. E. Maxwell.** sm. f°. Singapore, 1890.

——— ——— Annual report on the State of Sungei Ujong and Jelebu for the year 1889 by **W. R. H. Carew.** f°. Singapore, 1890.

Sturge, R. F.—Thirty years' weather at Bristol, from 1860 to 1889. Printed for private circulation. sm. 8°. Bristol, 1890.

Stuttgart, Königl. statistisches Landesamt. — Mitteilungen. 1890. Nos. 1–12. la. 8°. Stuttgart, 1890.

Contains "Witterungsübersicht . . . nach den Beobachtungen der württembergischen meteorologischen Stationen."

——— **Meteorologische Centralstation.**—Deutsches meteorologisches Jahrbuch. Jahrg. 1889. Meteorologische Beobachtungen in Württemberg. Mitteilungen der mit dem königl. statist. Landesamt verbundenen meteorologischen Centralstation. Bearbeitet von **Dr. v. Zech** und **L. Meyer.** la. 4°. Stuttgart, 1890.

* **Sugny, J. de.**—Eléments de météorologie nautique. 8°. Paris et Nancy, 1890.

Sundell, A. F.—Åskvädren i Finland 1889. 8°. Helsingfors, 1890.

Süring, R. J.—Die vertikale Temperaturabnahme in Gebirgsgegenden in ihrer Abhängigkeit von der Bewölkung. Inaugural-Dissertation . . . der Friederich-Wilhelms-Universität zu Berlin . . . . am 25 April 1890. 8°. Leipzig-Reudnitz, 1890.

[Sydney Observatory.]—Results of meteorological observations made in New South Wales during 1888, under the direction of **H. C. Russell.** la. 8°. Sydney, 1890.

[——— ———] Results of rain, river, and evaporation observations made in New South Wales, during 1889; by **H. C. Russell.** la. 8°. Sydney, 1890.

——— **Royal Society of New South Wales.**—Journal and Proceedings. 1889. Vol. xxiii. 8°. Sydney, s.a.

Symons, G. J.—British rainfall 1889. On the distribution of rain over the British Isles, during the year 1889 . . . 8°. London, 1890.

Symons's Monthly Meteorological Magazine.—Vol. xxv., 1890. 8°. London, 1891.

Syracuse, Osservatorio Centrale di Siracusa.—Osservazioni meteorologiche fatte nell' osservatorio centrale di Siracusa e nelle stazioni della rete meteorico-agraria della provincia. Anno xiv., 1890, Jan.—Dec. 8°. Siracusa, 1890.

Tables météorologiques internationales, publiées conformément à une décision du Congrès tenu à Rome en 1879. la. 4°. Paris, 1890.

In English and German languages also.

‖ **Tacchini, P.**—Sopra un tromometro a registrazione fotografica. la. 8°. (*Rend. R. Accad. Lincei, serie* 4ª, vi., 1890, *p.* 432.)

Tacubaya, Observatorio Astronómico Nacional.—Anuario. 1891. Formado bajo la dirección del Ingeniero **A. Anguiano.** Año xi. sm. 8°. México, 1890.

Tananarive, Observatoire Royal de Madagascar.—Résumé des observations météorologiques faites à Tananarive par **E. Colin.** 1889. 8°. Tananarive, 1890.

Tebbutt, J.—Report of Mr. Tebbutt's observatory, the Peninsula, Windsor, New South Wales. 1889. 8°. Sydney, 1890.

* **Terby, F.**—Sur l'existence et sur la cause d'une périodicité mensuelle des aurores boréales. 8°. [*Bull. acad. Sc. Belgique*, 3me *sér.*, vi., 1883, *p.* 35.]

(Thomson, A. S.)—Observations on the climate of the North Island of New Zealand. sm. f°. Auckland, 1853.

Tiflis, Physikalisches Observatorium. — Magnetische Beobachtungen . . . im Jahre 1888–1889, herausgegeben von **J. Mielberg.** la. 8°. Tiflis, 1890.

In the Russian language also.

——— ——— Meteorologische Beobachtungen . . . . im Jahre 1889, herausgegeben von **J. Mielberg.** la. 8°. Tiflis, 1890.

In the Russian language also.

Todd, C.—Weather forecasts. Newspaper cutting. (*Adelaide Advertiser*, 1891, *Jan.* 28.)

Tokio, Meteorological Central Observatory.—Annual meteorological report. 1888, Part i. la. 8°. s.l.e.a.

In the Japanese language also.

——— ——— Cautionary signals. Notice. f°. Dated, January, 1890.

——— **Naval Observatory.**—Monthly report of the meteorological and magnetical observations. 1888 Jan.—Mch. la. f°. Sheets.

Discontinued after this date.

Tonga.—Statistics of the Tonga Islands for the year ended 31st December, 1889. sm. f°. Suva, 1890.

Contains meteorological observations for 1889.

Toronto, Magnetical Observatory.—General meteorological register for the year 1889. 8°. s.l.e.a.

——— **Meteorological Service, Dominion of Canada.**—Monthly weather review. 1890, Jan.—Dec. la. 4°. s.l.e.a.

* **Toynbee, H.**—Weather forecasting for the British Islands by means of a barometer, the direction and force of wind, and cirrus clouds. sm. 8°. London, 1890.

‖ **Trabert, W.**—Täglicher Gang von Luftdruck und Lufttemperatur an einigen Stationen der deutschen Schutzgebiete im äquatorischen Afrika und in Neu Guinea. la. 8°. (*Mittheil. aus den Deutsch. Schutzgebieten*, iii., *p.* 89.)

Trieste, I. R. Accademia di Commercio e Nautica.—Osservazioni meteorologiche instituite all' Osservatorio Marittimo. 1890, Jan.—Dec., and Results. oblong la. 8°. Sheets.

——— **Osservatorio Marittimo.**—Rapporto annuale . . . contenente le osservazioni meteorologiche . . . per l'anno 1887, redatto da **F. Osnaghi** e da **E. Mazelle.** Vol. iv. la. 4°. Trieste, 1890.

Trinidad, Royal Botanic Gardens.—Meteorological Returns. 1887, May June, Dec. 1888, Jan.—1890, Dec. sm. f°. Sheets.

Turin, Osservatorio della Regia Università.—Bollettino. Anno xxii., 1887. Oblong la. 8°. Turin, 1889.

‖ ——— ——— Osservazioni meteorologiche . . . 1888, 1889 . . . . . calcolate dal **G. B. Rizzo.** la. 8°. Torino, 1890. (*Atti R. Accad. Sc. Torino*, xxv., 1889–90.)

——— **Società Meteorologica Italiana.**—Annuario meteorologico italiano. Anno vi. 1891. sm. 8°. Torino, 1891.

——— ——— Atti della terza assemblea generale della Soc. Meteor. Ital. tenuta a Venezia dal 14 al 23 Settembre 1888. sm. 8°. Torino, 1890.

Turin, Società Meteorologica Italiana.—Bollettino mensuale pubblicato per cura dell' Osservatorio centrale del Real Collegio Carlo Alberto in Moncalieri Serie ii., vol. x. (della intera Collezione vol. xxv.) 1890. sm. f°. Torino, 1890.

Upsala, Observatoire Météorologique de l'Université.—Bulletin mensuel. Vol. xxi., 1889. Par **H. H. Hildebrandsson.** la. 4°. Upsal, 1889-90.

Utrecht, Koninklijk Nederlandsch Meteorologisch Instituut.—De stroomen op de Nederlandsche Kust. la. 4°. Utrecht, 1890.

In the English language also.

——— ——— Nederlandsch meteorologisch Jaarboek. 1889. oblong 8°. Utrecht, 1890.

——— ——— Onweders in Nederland. 1889. Deel x. la. 8°. Amsterdam, 1890.

Venice, Osservatorio Patriarcale.—Annuario astro-meteorologico con effemeridi nautiche. 1889, 1891. Annos vii., ix. 2 vols. 8°. Venezia, 1888, 1890.

Ventosa, V.—Método para determinar la dirección del viento por las ondulaciones del borde de los astros. la. 8°. Barcelona, 1890. (*Crón. Cient., No.* 299, 1890.)

Vienna, K. K. Central-Anstalt für Meteorologie und Erdmagnetismus.—Beobachtungen. 1890, Jan.—Dec., and Results. 8°.

——— ——— Jahrbücher. 1888. Neue Folge xxv. Bd. la. 4°. Wien, 1889.

——— **K. K. Central-Anstalt für Meteorologie.**—Telegrafischer Wetterbericht. Jahrg. xiv., 1890. Jan. 1—Dec. 31. la. 4°. Sheets.

——— **kais. königl. geographische Gesellschaft.**—Mittheilungen. 1889. xxxii. Bd. (der neuen Folge xxii.) la. 8°. Wien, 1889.

(Volante, G.)—Osservazioni meteorologiche fatte in Alessandria alla Specola del Seminario nell' anno 1889. la. 8°. Alessandria, 1890.

Washington, Hydrographic Office.—Pilot charts of the North Atlantic Ocean. 1890, Jan.—Dec. 12 charts, la. f°.

[——— **Signal Office.**]—Annual report of the Chief Signal Officer of the Army to the Secretary of War for the year 1889. Parts i. and ii. 2 vols. la. 8°. Washington, 1890.

Part ii. has for sub-title :—" Preparatory studies for deductive methods in storm and weather predictions, by **C. Abbe.**"

——— ——— Bibliography of meteorology. A classed catalogue of the printed literature of meteorology from the origin of printing to the close of 1881; with a supplement to the close of 1889, and an author index. Prepared under the direction of **A. W. Greely.** Edited by **O. L. Fassig.** Part iii. Winds. 4°. Washington, 1891.

‖ ——— ——— Instructions to voluntary observers of the Signal Service. la. 8°. Washington, 1887. (*Ann. Rep. Chief Sig. Officer*, 1886, *p.* 273.)

——— ——— Monthly Weather review. 1890, Jan.—Dec. and Suppl. 4°. Washington, 1890-91.

‖ ——— ——— Report upon cold waves. Extract No. 5, from Ann. Rep. of the Chief Signal Officer, 1890. la. 8°. Washington, 1891.

——— ——— Tri-daily meteorological record. 1878. Jan.—Dec. 12 vols. oblong la. 8°. Washington, 1884.

——— ——— War Department weather map. 1890, Jan. 1.—Dec. 31. la. f°. Sheets.

——— **Smithsonian Institution.**—Annual reports . . . for the years ending June 30, 1887, and July 1888. 2 vols. 8°. Washington, 1889-90.

——— ——— Smithsonian contributions to knowledge. Vol. xxvi. la. 4°. Washington, 1890.

Waters, A.—Some meteorological conditions of Davos. Reduced to average curves. sm. 8°. Davos, 1890.

Weather periodicity.—la. 8°. (*Chambers's Journ.*, 1890, *Sept.*, *p.* 588.)

‖ **Weihrauch, K.**—Fortsetzung der neuen Untersuchungen über die Bessel'sche Formel und deren Verwendung in der Meteorologie. la. 8°. Dorpat, 1890. (*Schrift. Naturf.-Gesellsch. Univ. Dorpat*, v.)

‖ **Wellington, Meteorological Office.**—[Meteorological observations in New Zealand.] 1887, 1889. sm. f°. (*Statist. New Zealand*, 1887, *p.* 81, 1889, *p.* 80.)

* **Wells, J. C.**—The gateway to the Polynia. A voyage to Spitzbergen. 8°. London, 1873.

Wetter, Das.—Meteorologische Monatschrift für Gebildete aller Stände. Herausgegeben von **R. Assmann.** vii. Jahrg., 1890. la. 8°. Braunschweig, 1890.

|| **Whipple, G. M.**—A brief notice respecting photography in relation to meteorological work. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvi., 1890, *p.* 141.)

|| ——— On the change of mean daily temperature which accompanies thunderstorms in Southern England. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvi., 1890, *p.* 12.)

|| **Wild, H.**—Inductions-Inclinatorium neuer Construction und Bestimmung der absoluten Inclination mit demselben in Pawlowsk. Lu le 20 Nov. 1890. la. 4°. St. Pétersbourg, 1891. (*Mém. Acad. Imp. Sc. St. Pétersb.*, vii^e *sér.*, xxxviii., *No.* 3.)

|| ——— Neuer Anemograph und Anemoscop. sm. f°. St. Pétersbourg, 1890. (*Mél. phys. chim.*, xiii., *p.* 139.)

|| ——— Ombrograph und Atmograph. sm. f°. (St. Petersburg), 1890. (*Repert. Meteor.*, xiii., *No.* 8.)

|| ——— Über die Benutsung des electrischen Glühlichts für photographisch-selbstregistrirende Apparate. sm. f°. St. Pétersbourg, 1891. (*Mélanges phys. chim.*, xiii., *livr.* 2, *p.* 173.)

Wiltshire Rainfall.—1887–89. 3 vols. oblong 8°. Marlborough, 1888–90.

Winterhalter, A. G.—The international astrophotographic Congress and a visit to certain European observatories and other Institutions: Report to the Superintendent. Washington Observations for 1885. Appendix I. la. 4°. Washington, 1889.

Wolf, R.—Mémoire sur la période commune à la fréquence des taches solaires et à la variation de la déclinaison magnétique. 4°. (*Mem. R. Astr. Soc.*, xliii., 1875–77, *p.* 199.)

|| **Wollny, E.**—Forstlich-meteorologische Beobachtungen. Zweite Mittheil. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg*, xiii., *Heft* 1 *u.* 2, *p.* 134.)

|| ——— Untersuchungen über das Verhalten der atmosphärischen Niederschläge zur Pflanze und zum Boden. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg*, xiii., *Heft* 3 *u.* 4.)

Wragge, C. L.—Table of rainfall in Queensland, 1874 to 1887. sm. 8°. (*Pugh's Almanac and Queensland Directory*, 1889.)

Yale Observatory.—Report for the year 1889–90, presented by the Board of Managers of the Observatory of Yale University to the President and Fellows. la. 8°. s.l.e.a.

Yeates, S. M.—On a new table and formula for determining altitudes with the barometer. 8°. [*Journ. R. Dublin Soc.*, iv., 1865, *p.* 444.]

York, Yorkshire Philosophical Society.—Annual Report of the Council . . . . for 1889. la. 8°. York, 1890.

* **Zeitschrift für wissenschaftliche Geographie** unter Mitberücksichtigung des höheren geographischen Unterrichts. Herausgegeben von **J. I. Kettler.** Bd. vii. la. 8°. Weimar, 1890.

Zi-ka-wei, Observatoire Magnétique et Météorologique. — Bulletin mensuel. Tome xv., année 1889. sm. f°. Zi-ka-wei, 1890.

Zürich, Schweiz. Departement des Innern.—Graphische Darstellung der schweizerischen hydrometrischen Beobachtungen. 1890. la. f°. Sheets.

For the second half of the year the title is in French.

——— Tabellarische Zusammenstellung der Haupt.-Ergebnisse fur das Jahr 1886. f°. Bern, s.a.

In the French language also.

——— **Schweizerische meteorologische Central-Anstalt.** — Annalen. 1887, 1888. Der "Schweizerischen meteorologischen Beobachtungen." xxiv., xxv. Jahrg. 2 vols. 4°. Zürich, s.a.

——— ——— Wetterbericht, 1890, Jan. 1—Dec. 31. sm. f°. Sheets.

APPENDIX XVII.

Meteorological Office: Account of Receipts and Payments for the year ending 31st March 1891.

Receipts.	£ s. d.	£ s. d.	Payments.	£ s. d.	£ s. d.
Balance from year 1889–90		3,416 6 8	Administration:		
Parliamentary Vote		15,300 0 0	Payment of Council	988 15 0	
Repayment of expenses charged under—			Secretary	800 0 0	
(1.) Incidental expenses	15 2 7		Salaries and wages	789 14 0	
(2.) Expenses incidental to International Meteorological Congress	12 12 0		Rent, fuel, and lighting	713 6 10	
(3.) Special researches	2 3 11		Incidental and contingent expenses:—		
(4.) Observatories	3 10 6		Attendance, cleaning, &c.	372 15 2	
		33 9 0	Furniture and fittings	438 0 10	
Supply of Information:			Expenses incidental to International Meteorological Congress	69 13 8	
D.W. Charts and Forecasts	258 14 1		Pensions	186 16 4	
6 p.m. Charts	25 0 0				4,359 1 10
Information for Press Agencies, &c.	130 11 2		Special Researches		997 7 2
Telegrams	288 6 2		Land Meteorology:		
		702 11 5	Observatories and stations	2,308 18 0	
Sale of Instruments, &c.:			Salaries: —Discussion and reduction of observations	1,246 18 0	
Royal Navy (A)	31 12 0				3,555 16 0
Mercantile Marine account (B)	58 0 7		Weather Information and Forecasts:		
		89 12 7	Telegraphic reports and storm warnings	2,565 2 8	
Commissions executed for Colonial and Foreign Institutions, &c. (C)		672 17 10	Salaries: — Preparation and issue of reports and forecasts	1,810 10 8	
Commission charged on work done for Colonies, &c.		37 8 5			4,375 13 4
			Inspections:		
			Salaries and travelling expenses		706 8 9
			Ocean Meteorology:		
			Salaries:—Discussion and reduction of observations	1,608 0 0	
			Expenses incidental to the supply of instruments:—		
			Proportion for care and issue of instruments	200 0 0	
			Royal Navy	566 7 6	
			Mercantile Marine	190 6 8	
			Distant island and coast stations	4 16 8	
					2,569 10 10
			Commissions executed for Colonial and Foreign Institutions, &c.		587 6 10
			Balance:		
			Cash at Bank	3,024 12 4	
			„ at Office	76 8 10	
					3,101 1 2
	£	20,252 5 11		£	20,252 5 11

In the year 1890–91 the sum of 1,515*l.* 10*s.* 8*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, and rental of private wires.

APPENDIX XVIII.

LIST OF PUBLICATIONS, &c. issued under the Authority of the Meteorological Council.

OFFICIAL.

No. 1. Report for 1867. Presented to Parliament. 1*s.*
2. Instructions for Meteorological Telegraphy. New Edition 1891, prepared for the use of observers exclusively.
3. Fishery Barometer Manual. (New edition, 1887.) 6*d.*
4. Charts of Surface Temperature, South Atlantic Ocean. 2*s.* 6*d.*
5. Report for 1868. Presented to Parliament. 5*d.*
6. Report for 1869. Presented to Parliament. 10*d.*
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5*s.* each.
8. Barometer Manual. (Out of print, see Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5*s.* each.
10. Report for 1870. Presented to Parliament. 10*d.*
*11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2*s.* 6*d.*
*12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2*s.* 6*d.*
13. A Discussion of the Meteorology of the Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. Price, with Book of Charts, 5*s.*
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s.* each.
15. Report for 1871. Presented to Parliament. 10*d.*
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5*s.* each.
17. Report for 1872. Presented to Parliament. 1*s.*
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2*s.*
19. Quarterly Weather Report, 1873.—Parts I. to IV. 5*s.* each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20° — 30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20*s.*
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1873. 1*s.*
22. Report for 1873. Presented to Parliament. 4*d.*
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2*s.*
24. Instructions in the Use of Meteorological Instruments. [Reprinted 1888.] 2*s.* 6*d.*
25. Quarterly Weather Report for 1874.—Parts I., II., and IV., 5*s.* each. Part III., 5*s.* 9*d.*
26. Report for 1874. Presented to Parliament. 6*d.*

* The Meteorological Council have given away the copies which were placed at their disposal, but the work can be purchased from the Publishers.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. 24*s*.

28. Contributions to our Knowledge of the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger*. 1*s*.

29. Report for 1875. Presented to Parliament. 4*d*.

30. Quarterly Weather Report for 1875.—Parts I.—IV. 5*s*. each.

31. Report for 1876–7. Presented to Parliament. 3*s*. 5*d*.

*32. A Discussion of the Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. 15*s*.

33. Quarterly Weather Report for 1876 (New Series).—Part I., 6*s*.; Parts II., III., and IV., 5*s*. each.

*34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Vol. I.: Part I., 2*s*.; Part II., 10*s*.; Part III., 6*s*.; Part IV., 5*s*.; Part V., 6*s*.

35. Report for 1877–8. Presented to Parliament. 1*s*.

36. Report of the Proceedings of the Meteorological Congress at Rome, 1879. 1*s*. 6*d*.

37. Report on the Meteorology of Kerguelen Island. By the Rev. S. J. Perry, S.J., F.R.S. 3*s*.

38. Report for 1878–9. Presented to Parliament. 5*d*.

39. Meteorological Observations at Stations of the Second Order for the year 1878. 20*s*.

40. Aids to the Study and Forecast of Weather, by the Rev. W. Clement Ley, M.A. 1*s*.

41. Report for 1879–80. Presented to Parliament. 1*s*.

42. Report for 1880–81. Presented to Parliament. 1*s*. 2*d*.

43. Charts of Meteorological Data for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Price of the Charts, 25*s*.; of the Remarks, 7*s*.

44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E., by Capt. H. Toynbee. 7*s*. 6*d*.

45. Meteorological Observations at Stations of the Second Order for the year 1879. 20*s*.

46. Report on the Storm of October 13–14, 1881. By Robert H. Scott, F.R.S. 1*s*. 6*d*.

47. Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. 7*s*. 6*d*.

48. Report for 1881–2. Presented to Parliament. 1*s*.

49. Quarterly Weather Report for 1879. (New Series.) Parts I., II., and III., 6*s*. each; Part IV., 5*s*. 6*d*. Appendices and Plates. 27*s*.

50. Quarterly Weather Report for 1880. (New Series.) Parts I. and II., 6*s*. each; Part III., 4*s*.; Part IV., 6*s*. Appendices and Plates. 28*s*.

51. Hourly Readings, 1881. (New Series.) Part I., 10*s*. 6*d*.; Parts II., III., and IV., 21*s*. each.

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* The Meteorological Council have given away the copies which were placed at their disposal, but the work can be purchased from the Publishers.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 52. Quarterly Weather Report for 1877. (New Series.) Part I., 10*s.*; Part II., 5*s.*; Part III., 4*s.* 6*d.*; Part IV., 6*s.* Appendices and Plates. 27*s.*

53. Meteorological Atlas of the British Isles. 5*s.* 6*d.*

54. Hourly Readings, 1882. Parts I. and II., 20*s.* each; Part III., 22*s.* 6*d.*; Part IV., 26*s.*

55. Quarterly Weather Report for 1878. (New Series.) Parts I., II., III., and IV., 6*s.* each. Appendices and Plates. 28*s.*

56. Sunshine Records of the United Kingdom for 1881. 4*s.*

57. Meteorological Observations at Stations of the Second Order for the year 1880. 34*s.* 6*d.*

58. Report for 1882–3. Presented to Parliament. 10½*d.*

59. Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. 21*s.*

60. Principles of Weather Forecasting. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition), 2*s.*

61. A Barometer Manual for the Use of Seamen. 1*s.* 3*d.*

62. Monthly Weather Reports for 1884. Jan., Feb., March, May —Nov., 1*s.* 6*d.* each. April (with 2 Appendices), 2*s.* 6*d.* Dec., 1*s.* 9*d.*

63. Hourly Readings, 1883. Parts I., II., and III., 21*s.* each; Part IV., 30*s.*

64. Report for 1883–4. Presented to Parliament. 1*s.* 2*d.*

65. Monthly Weather Reports for 1885. Jan. to Dec., 1*s.* 6*d.* each.

66. Meteorological Observations at Stations of the Second Order for the year 1881. 35*s.*

67. Report for 1884–5. Presented to Parliament. 4*s.* 4*d.*

68. Monthly Weather Reports for 1886. Jan. to Dec., 1*s.* 6*d.* each.

69. Meteorological Observations at Stations of the Second Order for the year 1882. 35*s.*

70. Hourly Readings, 1884. Part I., 12*s.*; Part II., 10*s.*; Part III., 10*s.* 6*d.*; Part IV., 15*s.*

71. Synchronous Weather Charts of the North Atlantic and the adjacent Continents. Aug. 1, 1882, to Sept. 3, 1883. Parts I. to IV. (33 sheets each.) 17*s.* each.

72. Report for 1885–86. Presented to Parliament. 8*d.*

73. Meteorological Observations at Stations of the Second Order for the year 1883. 30*s.*

74. Hourly Readings, 1885. Parts I. and II., 11*s.* each; Part III., 10*s.* 6*d.*; Part IV., 12*s.*

75. Report for 1886–87. Presented to Parliament. 8*d.*

76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10*s.* 6*d.* Supplemental Chart, 6*d.*

77. Monthly Weather Reports for 1887. January to April, 1*s.* 6*d.* each. May to December, in wrapper, price 12*s.*

78. Meteorological Observations at Stations of the Second Order for the year 1884. 32*s.*

79. Report for 1887–88. Presented to Parliament. 1*s.*

80. Daily Weather Charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. 10*s.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 81. Hourly Readings. 1886. Parts I., II., and III., 10*s.* 6*d.* each. Part IV., 12*s.* 6*d.*

82. Meteorological Observations at Stations of the Second Order for the year 1885. 31*s.*

83. Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and Army Medical Department. 1852–1886. 23*s.*

84. Report for 1888–89. Presented to Parliament. 5½*d.*

*85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4*d.* per week. With Appendices and Monthly Supplements, priced separately.

86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

87. Weekly Weather Report for the year 1890. Vol. VII. Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately

88. Meteorological Observations at Stations of the Second Order for 1886. 25*s.*

89. Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo. 1886–88. By the late W. Reid, M.D. 8*s.* 6*d.*

90. Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. Price 7*s.*

91. Report for 1889–90. Presented to Parliament. 7½*d.*

92. Meteorological Charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras Hafún. 6*s.*

93. Harmonic Analysis of Hourly Observations of Air Temperature and Pressure at British Observatories. (In the Press.)

94. Hourly Means of the Readings obtained from the Self-recording Instruments at the Four Observatories under the Meteorological Council, 1887. 16*s.*

95. Meteorological Observations at Stations of the Second Order. 1887. 24*s.*

96. Weekly Weather Report for the year 1891. Vol. VIII., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual subscription, including Supplements and Appendices, post paid, 30*s.*

97. Hourly Means of the Readings obtained from the Self-recording Instruments at the Four Observatories under the Meteorological Council, 1888. (In the Press.)

98. Ten Years Sunshine in the British Isles (1881–90). (In the Press.)

99. Report for 1890–91. Presented to Parliament.

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* The publication of the Weekly Weather Report began in February 1878.

LIST OF PUBLICATIONS, &c.—*continued.*

NON-OFFICIAL.

No. 1. Report to the Committee on the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6*d.*

*2. Report to the Committee on the Meteorology of the North Atlantic.—By Captain H. Toynbee, Marine Superintendent. 1*s.*

*3. Report to the Committee on the Use of Isobaric Curves.—By Captain H. Toynbee, Marine Superintendent. 1*s.*

4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6*d.*

5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6*d.*

6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1872. 1*s.*

7. Notes on the Form of Cyclones in the Southern Indian Ocean. — By C. Meldrum, M.A., F.R.S. [Out of Print.]

8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 1873. 6*d.*

9. Report of the Permanent Committee of the Vienna Congress for 1874. 1*s.* 6*d.*

10. On the Physical Geography of that part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875.—By Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s.* 6*d.*

11. Report of the Permanent Committee of the Vienna Congress for 1876. With Supplement. 2*s.*

12. Reports to the Permanent Committee of the Vienna Congress on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s.*

13. Report of the Permanent Committee of the Vienna Congress for 1878. 6*d.*

14. Report of the International Meteorological Committee Meeting at Berne, 1880. 1*s.*

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* The Meteorological Council have given away the copies which were placed at their disposal, but the work can be purchased from the Publishers.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. *2s.* 6*d.*

16. Report of the Third Meeting of the International Meteorological Committee, held at Paris, September 1885. 1*s.*

17. Report of the Fourth Meeting of the International Meteorological Committee held at Zürich, September 1888. 4*d.*

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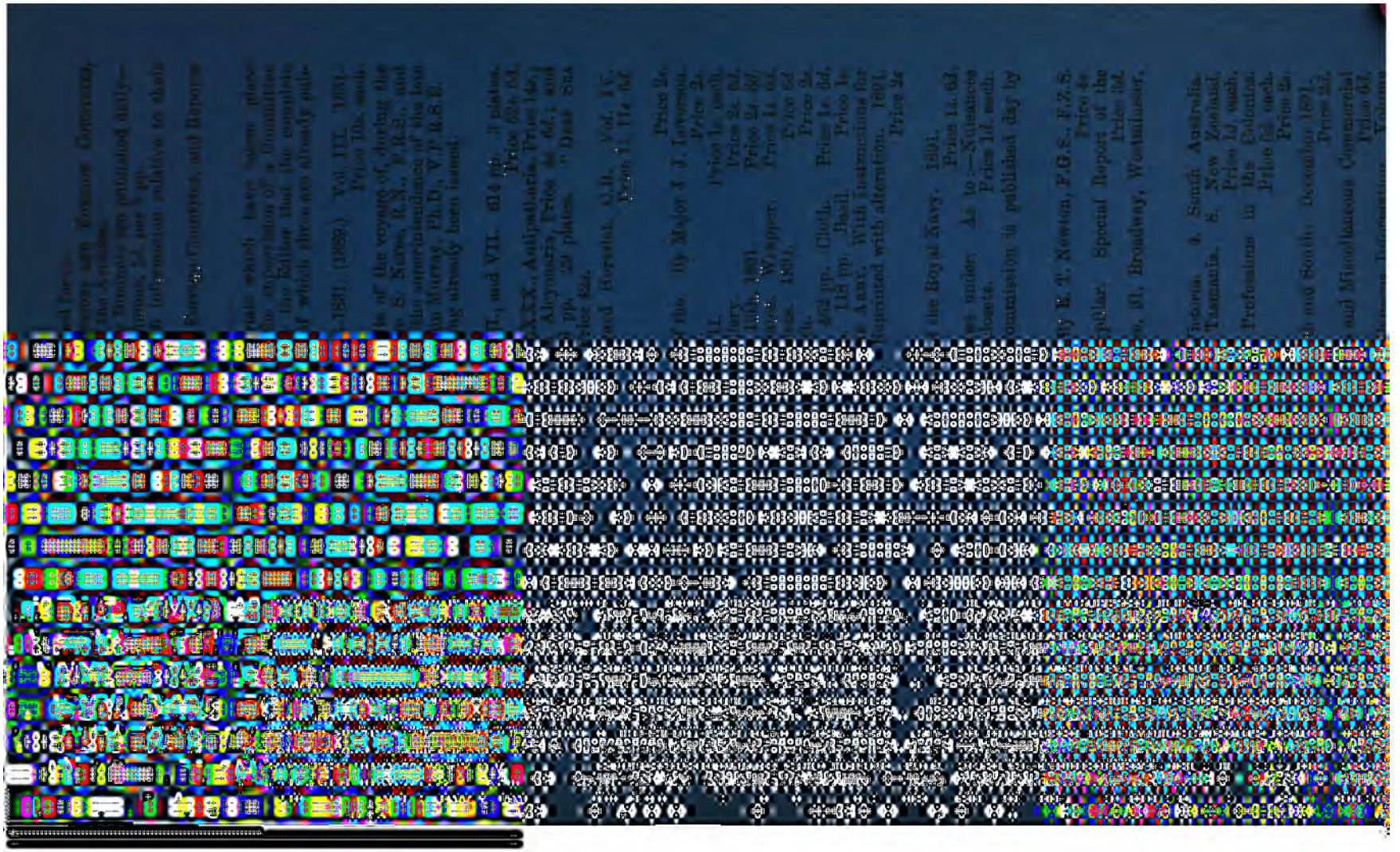
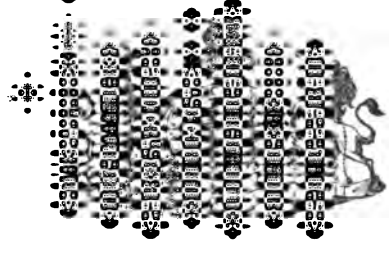


COUNCIL

SOCIETY,

for the Year ending 31st March 1892.

Presented to both Houses of Parliament by Command of Her Majesty.



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THE METEOROLOGICAL COUNCIL,

1891–92.

Lieutenant-General RICHARD STRACHEY, R.E., C.S.I., F.R.S., Chairman.

MR. ALEXANDER BUCHAN, M.A., LL.D., F.R.S.E.

Professor GEORGE HOWARD DARWIN, M.A., LL.D., F.R.S.

MR. FRANCIS GALTON, M.A., F.R.S.

MR. EDWARD J. STONE, M.A., F.R.S.

Captain WILLIAM J. L. WHARTON, R.N., F.R.S., Hydrographer of the Admiralty.

REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1892.

Introductory.

THERE has been no change in the Council during the year. The executive officers are, as stated in the last Report:—

Mr. R. H. Scott, M.A., F.R.S., Secretary.
Nav.-Lieut. C. W. Baillie, R.N., F.R.A.S., Marine Superintendent.

Registration of Council as a corporate body.

Registration of the Council under the Companies Act.—It was stated in the last Report that the Council had, with the sanction of the President and Council of the Royal Society, made an application to the Board of Trade for registration as an Association under the Companies Act, 1867. The necessary consent having been obtained, the Association was registered on the 8th of October 1891. The Memorandum and Articles of Association will be found at Appendix I., p. 25.

Removal of Valencia Observatory.

Removal of Valencia Observatory.—The circumstances which led to the removal of Valencia Observatory from the island to a situation on the mainland adjoining, have been already explained. The purchase of Westwood House, Cahirciveen, by the Royal Society, from the funds of the Council, was completed in the month of March 1892, and after some needful repairs had been executed, and alterations made to admit of the proper erection of the instruments, the change of the observatory to its new location was completed on the 28th of that month.

The International Meteorological Conference.

The International Meteorological Conference.—In the autumn a meeting of representatives of various meteorological establishments was held in Munich. It was attended by 33 persons representing most of the States of Europe, and also the United States, Brazil, and Queensland. The Council instructed their Secretary, Mr. Scott, to represent them on this occasion.

The English version of the Report of the Proceedings will as usual be published in due course.

PART I.

Ocean Meteorology.

Collection of information.

Collection of Information.—The practice followed by the Office with reference to observers at sea, as described in former Reports, remains unchanged.

Recognition of "excellent" observers.

Appendix II. (p. 28) contains a list of all the observers who during the past year have contributed logs classed as "excellent." Several of these observers have regularly co-operated with the Office for many years. The names which appear in the list for the first time are as follow:—

Observer's Name.	Ship.
Bell, Richardson, R.N.R. - -	Barquentine "Bootle."
Bett, William, Surgeon, R.N. -	H.M.S. "Stork."
Combe, J. W., Lieut., R.N. - -	H.M.S. "Penguin."
Conby, H. B. - - -	Ship "Garfield."
Davis, Harry - - -	Barque "Alexander Lawrence."
Martin, Walter, R.N.R. - -	S.S. "German."
Murray, Alexander, Junr. - -	S.S. "Windward."
Oliver, G., Lieut., R.N. - -	H.M.S. "Penguin."
Peterkin, William - - -	Ship "Khyber."
Rohde, H. P. R. - - -	Barque "Archdale."
Smyth, M. H., Lieut., R.N. - -	H.M.S. "Stork."
Spalding, T. F. - - -	S.S. "Australasian."
Walker, J. J., F.L.S., Chief Engineer, R.N.	H.M.S. "Penguin."
White, W. E., R.N.R. - -	S.S. "Ormuz."

Proportion of "excellent" to total number of logs received.

The total number of logs received in the year ending March 31, 1892, was 143, of which 106, or 74 per cent., have been classed as "excellent."

The average number of logs received annually during the five years, 1886–90, was 176, of which the per-centage of "excellent" logs was 75.

The Council take this opportunity of expressing their best thanks to the observers who have assisted them during the past year, and also to the Ocean Steamship Company, Liverpool, who have kindly presented to the Office a large number of the logs of their vessels.

They regret to have to announce the deaths of no less than eight of their observers, all of whom had sent in "excellent" logs, and many had been observers for a long period. They were Captains James Clarke, R. F. Hoskyn, R.N., R. C. Jennings, W. G. North, C. W. Pearson, P. Rowsell, and J. Thearle, and Mr. W. H. Young.

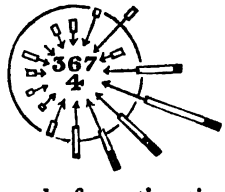
Appendix III. (p. 30) gives a list of the meteorological logs and of meteorological reports from stations abroad, received at the Office during the year.

The following summary of the voyages of the ships observing for the Office shows the districts from which observations were received during the year:— Districts from which observations are obtained.

To Baffin's Bay or Greenland - - - -	4
„ North America, East Coast - - -	14
„ „ „ West „ - - - -	9
Off East Coast of North America - - -	3
To West Indies - - - - -	3
„ South America, East Coast - - - -	13
„ „ „ West „ - - - -	7
„ Australia and New Zealand, viâ Cape of Good Hope	26
„ „ „ viâ Suez - -	8
At Australian stations - - - - -	4
To India, viâ Suez - - - - -	8
„ India, viâ Cape of Good Hope - - -	16
„ China, viâ Suez - - - - -	6
„ Cape of Good Hope - - - -	9
Off East Coast of Africa - - - -	3
Between British Ports - - - - -	5
To Continental Ports - - - - -	4

Red Sea Charts.—These charts will shortly be handed to the engraver. In the course of their preparation a suggestion was made by Lieut. Baillie for modifying the system hitherto adopted for the representation of wind results, which was approved by the Council and will be generally adopted in future, as being a decided improvement on the former method. In the new form of Wind Rose, which is given below, the arrows show by their length the frequency of winds of various directions, and by their thickness their various forces; light winds, forces 1 to 3; moderate winds, forces 4 to 7; and gales, forces 8 to 12:— Red Sea Charts. New wind Rose

Thus in the diagram selected as an illustration, a great prevalence of South-east winds is shown, and gales will be seen in this particular case to be almost exclusively confined to that quarter:—



The circle supplies a scale for estimating the frequency of winds in any direction. The length from the heads of the arrows to the circumference represents 5 per cent. of the whole number of observed winds (100 per cent. = 4 inches). The upper figures in the central space are the total number of observations, the per-centage of calms being given underneath.

Current Charts for the Atlantic, Pacific, and Indian Oceans.— The extraction of data from the Office logs and from the Remark Current Charts.

Books of the Royal Navy has been completed, and the Royal Navy log books are now being examined for the period prior to the introduction of the uniform system of Remark Books. The number of these logs examined during the year has been 4,046.

Southern Ocean.

Southern Ocean.—The extraction of data from the Office logs for this district has been completed. The log books of H.M. ships are now being dealt with, to the number of 567 in the year, and valuable information has been obtained from the logs of the various steamship companies carrying on trade with Australia.

Distant stations.

Supply of Instruments to distant Stations.—On a representation received through the Colonial Office, it was decided to supply a complete outfit of meteorological instruments, including the self-recording anemograph formerly at Heligoland, to St. Helena, the Governor of which island had undertaken to arrange for the regular record of the usual meteorological observations at a station specially selected with the object of obtaining a satisfactory register of the wind; a set of instruments has also been supplied to Mr. Knott, Vice-Consul at Mojange, Madagascar, and to Mr. Anstruther at the cable station at Fernando Noronha.

Royal Naval Exhibition.

Royal Naval Exhibition.—The Council took advantage of this opportunity to exhibit specimens of the charts which have recently been issued by the Office, and of the instruments which they supply to captains willing to observe for them. These exhibits attracted considerable attention from the visitors.

In addition the forecasts and weather charts emanating from the Office were exhibited and renewed three times daily.

Stock of Instruments belonging to the Office.

Supply and Stock of Instruments.—In Appendix IV. (p. 36) is given a list of the meteorological instruments supplied by the Office to ships in the Royal Navy during the year, with a statement for the 31st March 1892 of the stock and distribution of the instruments standing on the books to the account of the Admiralty.

Appendix V. (p. 37) gives similar information with regard to the disposal of the other instruments belonging to the Office, remaining in store, or which have been supplied to the Mercantile Marine, and to observatories, telegraph offices, &c.

PART II.

Weather Telegraphy and Forecasts.

Administrative.

There have been no serious interruptions of telegraphic communication during the year.

A new reporting station has been established at the North Foreland; in this case, as in that of Malin Head, the Council have been indebted to Lloyd's Committee for the means of obtaining regular observations at an outlying station not otherwise available. Among the observers the only changes have been the substitution of Mr. G. Freeman for Mr. J. H. Watson at Spurn Head and of Mr. W. Newlands for Mr. J. Hay at Leith.

Administrative.

The Council have to express their sincere regret at the death by accident of Mr. John Hartnup, the superintendent of the Bidston Observatory, Birkenhead, which occurred on April 21, 1892. Mr. Hartnup had for many years, by permission of the Mersey Docks and Harbour Broad, furnished to the Office the weather reports from his observatory.

A list of the telegraphic reporting stations, British and Foreign, is given in Appendix VI. (p. 38).

Daily and Weekly Weather Reports.

The work in this branch of the Office continues to increase. The Daily and Weekly Weather Reports, in particular, have been extended and improved.

In the volume of the Daily Weather Reports for the second half of 1891 the following monthly averages for nearly all the stations have been published as a preface :—

Pressure, 20 years, 1871–90.
Temperature, 20 years, 1871–90.
(viz., maximum, minimum, and dry and wet, the two latter for 8 a.m.)
Rain, 25 years, 1866–90.

A new column has also been added to the Report giving an account of the weather which has prevailed at the stations in the intervals between the observing hours.

The Weekly Weather Report has been improved by the addition of two new stations, and by a table giving weekly sunshine records for ten other stations.

Inspection of the Stations.

Inspection of the Telegraphic Reporting Stations.—The telegraphic reporting stations have been inspected during the year, in England by Mr. Ley, in Scotland by Mr. Buchan, and in Ireland and Wales by Mr. Scott. The reports submitted by the Inspectors to the Council, which are printed in Appendix VII. (p. 39), show that the efficiency of the service continues to be satisfactorily maintained.

Discussion the reports.

Discussion and Publication of the Information received.—The practice of the Office in collecting, discussing, and disseminating the meteorological information received by telegraph is described in Appendix VIII. (p. 58). The Daily Weather Report has appeared regularly during the year; for details see that Appendix. It is distributed free of cost as follows :—To newspapers, seven copies; to seaports, for public exhibition, 71 copies; to Government offices and public institutions, 66 copies; to correspondents of the Office, 73 copies; and to foreign meteorological establishments, 46 copies. Nearly 200 copies are issued regularly to subscribers.

The Weekly Weather Report, with its Monthly Appendices, has also appeared regularly; for particulars of this publication see Appendix VIII., p. 58.

Display of information in front of the Office.

Public display at the Office of the State of the Weather on British Coasts.—This arrangement, which was made with a view to the earliest possible supply to the public of the latest information as to the weather received from the principal points on the eastern, southern, and western coasts, has been regularly carried out, and it is believed with general public approval. It supplies at 9.30 a.m. and 3 p.m. every week day the substance of the reports received by telegraph, of the state of the weather and sea at the following stations: Yarmouth, Dungeness, the Needles (Hurst Castle), Scilly, Holyhead, and Valencia, and this is displayed in a conspicuous manner on the front of the Office, 63, Victoria Street, S.W.

Supply of Forecasts to the Fleet.—At the request of the Admiralty daily forecasts were supplied to the Commander-in-Chief of the "A" Fleet during the continuance of the Manœuvres as in previous years, and also to the Commander-in-Chief, Devonport. This latter service is continued throughout the year. It commenced at the end of 1890.

Forecasts.

Weather Forecasts.—Forecasts are prepared three times a day, namely, at 11 a.m., at 3.30 p.m., and 8.30 p.m. The Forecasts prepared at 11 a.m., on the information derived from the 8 a.m. reports, refer to the probable weather between noon on the day of issue and noon on the following day. They are publicly exhibited in several places in London,* and are supplied to the afternoon editions of the newspapers. The 3.30 p.m. Forecasts are employed for storm warnings only, excepting in the hay harvest season, when they are issued as subsequently explained. The forecasts at 8.30 p.m. are specially prepared for publication in the morning newspapers, but all the forecasts are available for the information of anyone who applies for them at the Office.

Inquiries at the Office.

The inquiries received through the Post Office for special forecasts during the year amounted to 84, and the personal applications to 66. The rules of the Office relating to such inquiries are stated in Appendix VIII. (p. 62).

Results of Forecasts.

The results of a comparison of the Forecasts issued at 8.30 p.m. during the year, with the weather actually experienced, are given in Appendix IX. (p. 63). The following summary shows the successes and failures over the whole United Kingdom, estimated as explained in that Appendix. The results were best in England, South, and worst in Scotland, West. The total per-centage of success was 2 lower than in 1890–91.

---

* Viz., in the City at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's, Cornhill, and Messrs. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and House of Commons, at Messrs. Elliot's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and Messrs. Pastorelli's, New Bond Street; and at the Office, 63, Victoria Street.

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1891–92. Results of Forecasts.

Districts.	Per-centages.				Total per-centage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	51	32	11	6	83
„ E. - -	54	27	14	5	81
ENGLAND, N.E. - -	51	30	14	5	81
„ E. - -	49	33	13	5	82
MIDLAND COUNTIES -	50	29	15	6	79
ENGLAND, S. - -	52	32	12	4	84
SCOTLAND, W. - -	46	29	15	10	75
ENGLAND, N.W. -	50	30	13	7	80
„ S.W. -	51	31	11	7	82
IRELAND, N. - -	53	29	11	7	82
„ S. - -	46	32	12	10	78
Summary - -	50	30	13	7	80

* Note "partial" implies "more than half."

The following table shows for each year from 1882 to 1891, inclusive, the per-centages of complete and partial success of the Forecasts issued at 8.30 p.m. for the whole year. Testing of Forecasts.

PER-CENTAGES of RESULTS of FORECASTS for the whole of the BRITISH ISLES.

Year.	Complete Success.	Partial, *i.e.*, more than Half Success.	Total Success.
1882 - -	43	37	80
1883 - -	48	33	81
1884 - -	50	31	81
1885 - -	50	34	84
1886 - -	49	31	80
1887 - -	52	32	84
1888 - -	51	31	82
1889 - -	49	32	81
1890 - -	50	32	82
1891 - -	50	30	80
Average - -	49	32	81

Hay Harvest Forecasts.—The Council renewed in 1891 the offer made in previous years to the Royal Agricultural Society, the Royal Dublin Society, and the Highland and Agricultural Society to send Daily Forecasts *gratis* during the haymaking season to a number of observers selected by those Societies, on two conditions, viz., that the information should be made known as widely as possible, and a record of the weather actually experienced sent Hay Harvest Forecasts.

Hay Harvest Forecasts.

weekly to the Office. The Societies accepted the proposal, and the Forecasts were issued as shown in the following table:—

LIST of those who received HAY HARVEST FORECASTS in 1891.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass	Golspie.
	Major Smith	Munlochy, Inverness.
1. SCOTLAND, E.	J. Whitton	Glamis Castle, by Forfar.
	G. Murdoch	Rothiemay, Huntly.
	C. W. L. Forbes	Aberfeldy.
2. ENGLAND, N.E.	Sir J. Wilson	Chillingham Barns, Chatton, Northumberland.
	J. Turner	The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck	High House, Thorpe, Norwich.
	Sir J. B. Lawes, Bt., and Prof. J. H. Gilbert, Ph.D.	Rothamsted, Harpenden.
4. MIDLAND COUNTIES	Royal Agricultural College.	Cirencester.
	E. E. Harcourt-Vernon	Grove Hall, East Retford.
5. ENGLAND, S.	C. Whitehead	Barming House, Maidstone.
	E. P. Squarey	The Moot, Downton, Wilts.
	The Aylesbury Dairy Company.	Stammerham, Horsham.
	M. J. Sutton	Reading.
6. SCOTLAND, W.	W. Calder	Castle Hill, Dalreoch, Dumbarton.
	M. J. Stewart, M.P.	Ardwell, Stranraer.
	J. S. R. Ballingal	Eallabus House, Islay.
7. ENGLAND, N.W.	G. W. Wray	Leyburn, Yorkshire.
	The Earl of Derby, K.G.	Knowsley Hall, Prescot.
8. ENGLAND, S.W.	The late Colonel T. Picton Turbervill.	Ewenny Priory, Bridgend, Glamorganshire.
	The Earl of Ducie	Tortworth, Gloucestershire.
	T. Dyke	Long Ashton, Clifton, Bristol.
	R. Neville Grenville	Butleigh Court, Glastonbury.
9. IRELAND, N.	E. F. Farrell	Moynalty, Co. Meath.
	J. M. Wilson, J.P.	Currygrane, Edgeworthstown.
10. IRELAND, S.	D. A. Milward	Lavistown, Kilkenny.
	W. Talbot Crosbie, D.L.	Ardfert Abbey, Tralee, Co. Kerry.
	The Earl of Rosse, K.P.	Birr Castle, Parsonstown.

In addition to the above names the forecasts were sent to six other gentlemen at their own cost.

The issue of the forecasts commenced on June 15th with those for the South and East of England, and were continued for about five weeks, ending on the 18th of July in those districts. In

other parts of the country they commenced and ended about a fortnight later. Hay Harvest Forecasts.

The general result of the issue of these forecasts, shown by the subjoined table, has been prepared solely from the reports of the above-mentioned gentlemen, and is entirely independent of any estimate formed within the Office itself:—

SUMMARY of RESULTS.—HAY HARVEST FORECASTS, 1891.

Districts.	Names of Stations.	Per-centages.				Total per-centage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N. -	Munlochy and Golspie - - - -	40	42	17	1	82
„ E. -	Aberfeldy, Glamis, and Rothiemay -	49	41	9	1	90
ENGLAND, N.E. -	Chatton and Ulceby - - -	61	26	11	2	87
„ E. -	Rothamsted and Thorpe - -	69	23	8	—	92
MIDLAND COUNTIES	Cirencester and East Retford - -	70	22	8	—	92
ENGLAND, S. - -	Reading, Maidstone, Downton, and Horsham.	62	28	6	4	90
SCOTLAND, W. -	Stranraer, Islay, and Dumbarton -	52	35	11	2	87
ENGLAND, N.W. -	Leyburn and Prescot - - -	60	34	6	—	94
„ S.W. -	Tortworth, Clifton, Bridgend, and Glastonbury.	66	23	9	2	89
IRELAND, N. - -	Moynalty and Edgeworthstown -	58	32	10	—	90
„ S. - -	Tralee, Kilkenny, and Parsonstown -	56	34	8	2	90
	Mean for all districts - -	58	31	10	1	89

These figures show that the results for the forecasts for 1891 reached a total per-centage of success of 89, being the same figure as was recorded in the two preceding years.

The Council regret that they have been informed by the Board of Agriculture that that Department does not see its way to aid in the further dissemination of these forecasts.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix X. (p. 64) are given the names of the stations furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade issued in February 1874. Storm Warnings.

These stations were, at the end of March 1892, 170 in number, situated:—

81 in England, 16 in Wales, 47 in Scotland, 20 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

An application was received during the year from the Royal National Lifeboat Institution for the supply of daily forecasts to all lifeboat stations on the coast. The Council were reluctantly obliged to reply that the grant at their disposal would not suffice for the additional cost of telegraphing daily to these stations.

A comparison has been made in the Office between the warnings issued during the year and the weather experienced on our coasts, the warnings being tested by the method explained in Appendix

Storm Warnings.

VIII. (p. 63). The results of this comparison are shown in the following tables:—

RETURN of the RESULT of the COMPARISON between the WARNINGS ISSUED and the WEATHER EXPERIENCED in 1891.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 and 7.	Warnings not justified by subsequent Weather.	Warnings late. Force 9 reached at two Stations before issue.	Warnings partially late. Force 9 reached at one Station before issue.	Storms for which no Warning was issued.
Scotland, N.E. -	50	35	9	2	1	3	——
„ E. -	35	13	18	4	—	—	——
„ N.W. -	52	30	14	4	4	—	Dec. 15.
„ W. -	44	27	12	5	—	—	Dec. 15.
Ireland, S.W. -	46	35	5	5	—	1	March 2—Nov. 11.
„ N.W. -	58	39	7	1	1	5	March 5–6; May 15; Nov. 28; Dec. 15.
Irish Sea - -	41	30	4	—	1	6	March 5–6; May 15; Oct. 11.
St. George's Channel	36	20	10	3	1	2	Dec. 7.
Bristol Channel -	34	20	11	3	—	—	Dec. 7.
England, S.W. -	33	18	10	3	—	2	Dec. 7.
„ S. -	27	15	10	2	—	—	——
„ S.E. -	25	15	8	2	—	—	Oct. 22.
„ E. -	22	10	8	4	—	—	——
„ N.E. -	24	18	2	1	1	2	Feb. 11; March 5–6; May 15; Nov. 11; Dec. 3.
Totals - -	522	325	128	39	9	21	
Per-centages -	—	62·3	24·5	7·5	1·7	4·0	

NOTE as to GALES experienced in 1891 on certain parts of our coasts, and for which WARNINGS were NOT ISSUED.

These were 12 in number, and may be classified as follows:—

(1.) Gales of *February* 11, *March* 2, *May* 15, *October* 11, *November* 3, and *December* 3, were due merely to the fact that storms which had been duly warned for in adjacent districts spread somewhat further than had been anticipated at the time when the warnings were being issued.

(2.) Gales of *March* 5–6, *November* 2, and *December* 7; The approach of these depressions not indicated by the latest reports received prior to their advance.

Gale of *October* 22. Strong but very local gale from S.S.W. on east coast of Kent and at mouth of Thames. Apparently due to the development over England during the night of local disturbances; secondary to a large system in the W., which was too shallow to cause gales.

Gales of *November* 11 (North-easterly in Ireland S.W., South-easterly in England N.E.). Due to a disturbance which advanced

directly over the kingdom from the south-westward, but which proved to be much deeper than was anticipated.

Gales of *December* 15. This depression was complex, and appeared to be advancing in such a direction that the extreme north-west coast did not seem to be threatened. The centre, however, took a more westerly course than was anticipated, and the coasts were involved in the general disturbance.

Comparison of results for 1891 with previous years.

The following table contains a comparative statement of the storm warnings and their results in 1891, and in the ten preceding years. It will be seen that the total per-centage of warnings justified is 86·8, being even better than that for the preceding year. The per-centage of warnings not justified by weather, or, in other words, of total failures, is the lowest on record.

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
		p.c.	p.c.	p.c.	p.c.
1881	454	58·6	23·3	81·9	14·8
1882	503	61·4	21·1	82·5	14·9
1883	610	56·2	21·6	77·8	20·8
1884	461	66·4	20·0	86·4	12·1
1885	591	55·3	24·0	79·3	19·5
1886	542	55·3	26·9	82·2	15·9
1887	472	55·5	26·1	81·6	16·4
1888	539	55·3	28·6	83·9	14·3
1889	373	47·7	33·5	81·2	16·9
1890	525	61·0	25·5	86·5	9·3
1891	522	62·3	24·5	86·8	7·5

Fishery Barometers.—To add to the means of obtaining warnings of stormy weather by the sea-going population, barometers were many years ago supplied by the Board of Trade on loan to fishing villages and other places on the coast, to be set up for public information. The whole number of stations supplied by the Office with these instruments is 185. Of these 60 are in England, 6 in Wales, 52 in Ireland, 62 in Scotland, 4 in the Isle of Man, and 1 in Jersey. The list is given in Appendix XI., p. 67.

PART III.

Land Meteorology of the British Isles.

Observatories and Stations.—The observations of the climate of the British Isles, which are received by the Office from certain stations, may be arranged in five classes, according to the degree of completeness with which they are made.

Self-recording observatories.

1. The Observatories furnished with self-registering instruments by which all the principal meteorological phenomena are recorded

continuously. These alone afford the materials necessary for the study of the periodic variations of the meteorological elements.

Anemographic stations.

2. Anemographic stations furnished with instruments registering the wind only. The records from these stations relate rather to weather as distinguished from climate, and are especially important in connexion with storms. They are often useful in affording evidence available in courts of law with respect to collisions at sea, and damage done by wind.

Stations of Second Order.

3. Stations of the Second Order furnishing climatological information from eye observations taken twice a day. The observers at these stations are all volunteers.

Telegraphic Reporting Stations.

4. The Telegraphic Reporting Stations, at which the observations are taken by eye, but supplemented in some cases by self-recording aneroids, &c., supply the material upon which the daily weather reports and forecasts are based. The hours of observation at these stations are determined by the requirements of the telegraphic system, as explained in Part II., but the data which they furnish are also utilized to afford climatological information for parts of the country where Stations of the Second Order do not exist.

Extra stations.

5. Extra stations furnishing returns with less completeness and detail than those of Class 3.

Sunshine stations.

A continuous record of the amount of bright sunshine is received from 44 stations in the British Isles, of which some are First or Second Order stations, whilst from others the sunshine record is alone received. See Appendix XII., p. 68.

A fuller account of these several stations and of the methods employed by the Office in dealing with their records will be found in Appendix XIII., p. 69.

Documents received.

Appendix XIV., p. 72, contains a list of all documents relating to the land meteorology of the British Isles received at the Office during the year.

Inspection of stations.

Inspection of the Stations.—The self-recording observatories and the anemographic stations (Classes 1 and 2), as well as the Telegraphic Reporting Stations (Class 4), are regularly visited each year by the Inspectors of the Office. The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 3), some belong to the Royal Meteorological Society, and these are visited by an Inspector appointed by that Society, an allowance being made by the Office toward the cost of the inspection, in accordance with the recommendation of the Treasury Committee (1877). The remaining Stations of the Second Order, including those belonging to the Scottish Meteorological Society, are visited, most of them annually, by the Inspectors of the Office. The Superintendent of the Kew Observatory, Mr. G. M. Whipple, and his chief assistant, Mr. T. W. Baker, are specially employed to inspect and report on the self-registering apparatus, and on the photographic processes at the observatories. Extracts from the Reports of the Inspectors are given in Appendix VII., p. 39.

Information supplied to the General Register Office, Dublin.—Reports from eleven of the Irish stations of the Office have been regularly supplied to the Registrar General for Ireland, for his Weekly and Quarterly Returns. Reports supplied to Registrar General for Ireland.

The Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office (see Appendix VIII., p. 58), supplies, by its synchronous charts and Monthly Summaries, a very complete and instructive view of the chief meteorological changes, day by day, over the greater part of Europe, such as is not to be found in any of the similar publications issued by any other office. Publications.

Appendix I. to the Weekly Weather Report for 1891 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature for each district, for the 26 years 1866–1891, and also the Monthly and Progressive values of Accumulated Heat, Rainfall, and Bright Sunshine for all the districts in each month of 1891. Appendix II. to the same Report gives the Weekly and Progressive values for the same elements during the year 1891 (in continuation of Appendix II. for the year 1890).

Hourly Readings of Meteorological Instruments.—The Volume of Hourly Means for 1888 has appeared, and that for 1889 is in a very advanced state. These volumes differ in no respect, as to arrangement, from that for the year 1887, described in the last Report. Hourly Readings of Meteorological Observations.

Harmonic Analysis of the Hourly Observations at British Observatories.—A volume containing a full series of tables illustrative of this method of dealing with the Hourly Values of the Temperature and Pressure at the seven self-recording observatories maintained by the Meteorological Office, and at Greenwich, has been published. It deals with the hourly records of Temperature and Pressure at Greenwich for 20, and at the seven observatories for 12 years, for every month of every year. It is believed to be the first systematic publication of the description that has till now been brought out by any of the established meteorological institutions. Harmonic Analysis of the Hourly Readings.

The computation of mean hourly values, on the system explained fully in the Report for 1890, of the temperature of the air and of barometrical pressure for the seven observatories for each month, has been completed for several years, and is still being carried on. The work is somewhat heavy, but considerable progress has already been made with it, and when completed it will supply data which would not otherwise be made available for meteorologists.

Observations at Stations of the Second Order.—The volume for 1888 is now nearly complete.

Stations for publication.

The following is the list of stations for which returns are being published for 1888:—

STATIONS for PUBLICATION in DETAIL on Form A., 21 in Number.

Stations.	In connexion with	Years already published in detail.	Remarks.
Glasgow - -	M. O.	12	Formerly observatories. 10 years hourly readings already published. Continuous records of pressure, temperature, wind, and rainfall still available, except for Armagh, which furnishes wind and rain only. For Stonyhurst and Armagh the records from 1884 have been published on Form A.
Stonyhurst -	M. O.	14	
Armagh - -	M. O.	14	
Dunrobin Castle -	S. Met. Soc.	8	
Braemar - -	S. Met. Soc.	8	High-level station (1,113 feet).
Dundee - -	S. Met. Soc.	8	
Wolfelee - -	S. Met. Soc.	2	
Scarborough -	R. Met. Soc.	7	
Hillington -	R. Met. Soc.	11	
Churchstoke -	R. Met. Soc.	12	
Carmarthen -	R. Met. Soc.	13	
Margate - -	R. Met. Soc.	6	
Babbacombe -	R. Met. Soc.	11	
Swanbister (Orkneys).	M. O.	2	This is the most northern station available, and there is a continuous record of wind.
Laudale - -	M. O.	9	
Douglas (Isle of Man).	M. O.	10	
Southampton -	M. O.	10	At both of these stations there are long series of observations available taken by the officers of the Ordnance Survey.
Dublin (Mountjoy Observatory).	M. O.	2	
Markree Castle -	M. O.	13	
Parsonstown -	M. O.	15	
Londonderry -	M. O.	9	

List for Publication on Form B. (Monthly Means and Summaries). Stations for publication.

Swanbister.
S Lairg.
S Dunrobin Castle.
S Gordon Castle.
S Glencarron.
Aberdeen.
S Fort Augustus.
S Braemar.
S Fort William.
S Lednathie.
Laudale (Argyleshire).
S Dundee.
S Ochtertyre.
S Callton Mor.
Glasgow.
S Rosewell.
S Rothesay (Isle of Bute).
S Marchmont.
S Wolfelee.
S Pinmore (Ayrshire).
S Glenlee.
M Cramlington.
S Cargen.
Durham.
Newton Reigny.
Aysgarth (Yorkshire).
M Scarborough.
Cronkbourne (Douglas), Isle of Man.
York.
Stonyhurst.
M Wakefield.
Prestwich.
M Llandudno.
M Buxton.
M Cheadle.
M Hillington (Norfolk).
Uppingham.
M Churchstoke (Montgomeryshire).
Geldeston (Beccles).
M Bennington.
M Cheltenham.
St. David's.
M Carmarthen.
M Berkhamsted.
Kew.
M Margate.
Southampton (Ord. Survey Office).
Eastbourne.
M Rousdon.
M Dartmoor.
M Babbacombe (Torquay).
Falmouth.
Londonderry.
S Lissan (Co. Tyrone).
Armagh.
Brookeborough (Colebrooke Park).
Markree Castle (Co. Sligo).
Edgeworthstown.
Dublin (Glasnevin).
Dublin (Mountjoy Observatory, Phœnix Park).
Dublin (City).
Parsonstown (Birr Castle).
M Killarney.
Valencia.

The Stations marked S belong to the Scottish, and those marked M to the Royal Meteorological Society.

With reference to these stations and the arrangements with the Royal Meteorological Society and the Scottish Meteorological Society as to the supply of information therefrom, a considerable increase has been made in the allowances to the respective Societies, inasmuch as it was found that the terms hitherto existing were not sufficient to defray the cost of supply of the information.

Removal of the Anemometer to Deerness, Orkney.—In the month of April the anemometer, which had been removed from Swanbister to Stenness in the month of August preceding, was again removed to Deerness School House, the observer having received the appointment of schoolmaster in that parish. Removal of Anemometer in the Orkney Islands.

Part IV.—Miscellaneous.

Storm Warnings for the West Indies.—An inquiry was received in January from the Colonial Office as to the advisability of instituting a system of storm warnings among the Windward and Leeward Islands, with the view of giving timely intelligence of West Indian Storm Warnings.

hurricanes. The Council strongly recommended the introduction of such a system.

Sea Surface Temperature.

Sea Surface Temperature on the Coasts of the British Isles.—These observations, which are obtained through the courteous assistance of the Admiral Superintendent of Naval Reserves, the Trinity House, and the Commissioners of Irish Lights, are still continued, and a large amount of valuable information is thereby collected.

Cloud Observations.

Cloud Photography and Measurement.—These researches have been continued, and an account of the results hitherto obtained, and of the methods adopted to procure them, was laid before the Royal Society on the 30th of April, and printed in their Proceedings, Vol. xlix.

Anemometer Comparisons.

Anemometer Experiments.—As intimated in the last Report, Mr. W. H. Dines has continued his experiments on the comparison of anemometers. This investigation was first instituted at the suggestion of the Royal Meteorological Society, and has been conducted by the aid of a grant from the Meteorological Council. A notice of the results will be found at Note A., p. 23.

The Electrical Anemometer.

The Electrical Anemometer.—The Post Office Telegraph Department, by which this instrument was constructed, having expressed their readiness to make further trials of its action, it was handed over to them for that purpose.

The Electrograph.

Electrograph.—The performance of this instrument, devised for the registration of atmospheric electricity, at the Kew Observatory has been unsatisfactory of late, and the Council have requested the Kew Committee to take up the subject by obtaining a discussion of the results that have been recorded in the past, and of improving the system of registration, should those results give evidence of the continuance of the registry being of scientific value.

Simultaneous Observations.

Simultaneous Observations.—The Office has received intimation from the Weather Bureau, Washington, that the service of International simultaneous observations, taken at Greenwich mean noon, which was organized in 1874, at the request of the Chief Signal Officer of the United States, had been discontinued when that officer was relieved of his meteorological duties in July, 1891.

The number of these observations which have been received during the year from the Royal Navy has been 3,460, and from the Mercantile Marine, 4,400.

Instruments for Public Parks.

Instruments for the Public Parks.—In the course of the year the Office was consulted by the County Council as to the erection in the parks, connected with the Council, of pillars bearing meteorological instruments, for the information of the public as to weather. Instruments of the pattern recommended by the Office have been erected in Battersea Park.

Rain Means for the British Islands.—In the year 1883 the Council published a set of tables of rain means for 366 stations, for the 15 years 1886–80, which had been obtained from Mr. G. J. Symons, F.R.S. As a further period of 10 years has now elapsed, the Council are considering the desirability of continuing the publication so as to bring it more up to date, and have entered into correspondence with Mr. Symons on the subject. Rain Means.

Sunshine of the British Isles.—Tables of the amount of sunshine recorded in the British Isles during the 10 years 1881–90 have been prepared by Mr. Scott, and published by the Office. Sunshine.

Diurnal Range of Rain.—A Report on the Diurnal Range of the Fall of Rain at the seven observatories for the 10 years 1871–80, was prepared by Mr. Scott in 1882, and published in the Quarterly Weather Report for 1887. This investigation has now become extended for a further interval of 10 years, down to 1890, and the calculations are nearly complete. Rain, Diurnal Range of.

Fog.—An enumeration of the days on which fog or mist has been reported at the telegraphic reporting stations has been undertaken for the 15 years 1876 to 1890. It will probably be completed in the course of the coming summer. Fog and Mist.

Library.

The library contains standard works on Meteorology and the allied Sciences, and is, besides, particularly rich in Transactions, Proceedings, Reports, and other Publications which give a large mass of Meteorological observational data from all parts of the world, extending over many years. It consists at present of over 11,500 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men for reference at the Office. Library.

Appendix XV., p. 78, contains a list of the additions to the library during the year, which have been catalogued upon cards, and are entered in the reference catalogues under (1) Authors, and (2) Subjects.

Expenditure.

Appendix XVI., p. 101, shows the receipts and payments during the year ending 31st March 1892. The amount voted by Parliament was 15,300*l.*, as in the previous year. Financial.

The following abstract of expenditure shows the amount properly chargeable to the year in question, and its distribution under the various heads, together with the increase or decrease in 1891–92 as compared with the previous year:

Financial.

Net Expenditure.	1890-91.	1891-92.	Increase.	Decrease.
General Administration:	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Payment of Council -	988 15 0	992 10 0	3 15 0	—
Secretary - -	800 0 0	800 0 0	—	—
Office - - -	789 14 0	793 6 0	3 12 0	—
Rent, fuel, and lighting -	726 10 3	700 11 3	—	25 19 0
Alterations to premises, attendance, and contingencies - -	737 16 2	553 10 3	—	184 5 11
Expenses incidental to International Meteorological Congress -	37 9 8	32 16 9	—	4 12 11
Pensions - -	186 16 4	186 16 4	—	—
Special Researches -	950 18 3	905 1 8	—	45 11 7
Land Meteorology -	3,412 10 0	5,182 2 9	1,769 12 9	—
Weather Information -	3,759 17 11	3,823 6 0	63 8 1	—
Inspections - -	706 8 9	584 0 11	—	122 7 10
Ocean Meteorology -	2,294 5 2	2,351 5 0	56 19 10	—
Total - - £	15,390 16 6	16,905 6 11	1,897 7 8	382 17 3

In the year 1891–92 the sum of 1,527*l.* 6*s.* 1*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, and rental of private wires. The increase under Land Meteorology is chiefly due to the outlay on account of the purchase of the lease of the new Valencia Observatory and its equipment, which amounted to 1,623*l.* 1*s.* 2*d.*

(Signed) R. Strachey,
Chairman.

NOTE A.

ANEMOMETER COMPARISONS carried out with the aid of a GRANT from the METEOROLOGICAL COUNCIL.

Abstract of a Report by Mr. Dines read before the Royal Meteorological Society, April 20, 1892.

The comparisons were made at the request of the Council of the Royal Meteorological Society, the cost being defrayed by the Meteorological Council. The instruments compared were:—

I. Kew Pattern Robinson Anemometer.
II. Self-Adjusting Helicoid Anemometer.
III. Small Air Meter.
IV. Foot Circular Pressure Plate.
V. A special modification of the Tube Anemometer.

After pointing out the impossibility of comparing a velocity instrument with a pressure instrument, when the pressure curve is obtained in the usual way, owing to the fact that the square of the mean of a number of quantities is different from the mean of the squares of the same quantities, the report describes the way in which the recording part of the pressure instruments was arranged so as to avoid this difficulty.

The comparisons were made by getting simultaneously, and automatically, records upon the same sheet of paper, the sheets so obtained amounting to about 100 yards in length.

At first the instruments were placed 9 feet above the roof of a house, but it was soon found that eddies from the gables and chimney-stacks rendered the results quite useless. The instruments were then raised to 18 feet, at which height very little trace of any eddies could be detected.

The proper factor for the Robinson Anemometer, except for a perfectly steady wind, being unknown, the true velocity was taken to be the mean of the velocities recorded by the other four instruments, and the per-centages were found to be—

Robinson (assumed Factor 2·00).	Helicoid.	Air Meter.	Pressure Plate.	Tube.
92·8	93·9	93·0	105·8	107·2

These values are the mean of the whole set, but the difference between the two extremes decreases not only as a per-centage, but also in actual value, as the velocity rises.

The report points out the close agreement between the three velocity instruments taken by themselves, and also between the two pressure instruments taken by themselves, and then discusses the way in which the difference between the steady artificial wind of the whirling machine and the natural, but variable, wind will affect each instrument.

It is shown that during light winds the velocity instruments will give too low, and the pressure instruments will give too high readings; that frequent and sudden changes in intensity will make the pressure instruments indicate too high values, and also decrease the factor of the Robinson cups; that frequent and sudden changes in direction will make the Helicoid and Air Meter read too low, but will not alter the other instruments.

The conclusions arrived at are, that with proper precautions, the tube anemometer will form a most useful and convenient instrument; that the relation between pressure and velocity for a foot circular plate and at ordinary barometrical pressure is $P = \cdot 003V^2$; and that the factor of the Kew Pattern Robinson Anemometer is practically constant for all velocities except very low ones, that its value must lie between 2·20 and 2·00, and that there is very great probability that it is within 2½ per cent. of 2·10.

(Signed) W. H. Dines.

APPENDIX.

APPENDIX I.

Memorandum of Association.

1. The name of the Association is "The Meteorological Council."
2. The registered office of the Association will be situate in England.
3. The objects for which the Association is established are:—

(1.) The administration of the Parliamentary Grant for Meteorological purposes.

(2.) The management of the Meteorological Office.

(3.) The doing all such lawful things as are incidental or conducive to the attainment of the above objects. Provided that the Association shall observe any lawful conditions or directions imposed or given by the Lords Commissioners of the Treasury as to the administration of the said Grant or the form of receipt to be given for payment of it.

4. The income and property of the Association, wheresoever derived, shall be applied solely towards the promotion of the objects of the Association as set forth in this Memorandum of Association; and no portion thereof shall be paid or transferred directly or indirectly, by way of dividend, bonus, or otherwise howsoever by way of profit, to the Members of the Association.

Provided that nothing herein shall prevent the payment, in good faith, of remuneration to any officers or servants of the Association, or to any Member of the Association, or other person, in return for any services actually rendered to the Association.

5. The fourth paragraph of this Memorandum is a condition on which a licence is granted by the Board of Trade to the Association in pursuance of section 23 of the Companies Act, 1867.

6. If any Member of the Association pays or receives any dividend, bonus, or other profit, in contravention of the terms of the fourth paragraph of this Memorandum, his liability shall be unlimited.

7. Every Member of the Association undertakes to contribute to the assets of the Association, in the event of the same being wound up during the time that he is a Member, or within one year afterwards, for payment of the debts and liabilities of the Association contracted before the time at which he ceases to be a Member, and of the costs, charges and expenses of winding up the same, and for the adjustment of the rights of the contributories amongst themselves, such amount as may be required not exceeding one pound, or in case of his liability becoming unlimited, such other amount as may be required in pursuance of the last preceding paragraph of this Memorandum.

8. If upon the winding up or dissolution of the Association there remains, after the satisfaction of all its debts and liabilities, any property whatsoever, the same shall not be paid to or distributed among the Members of the Association, but shall be transferred to the Lords Commissioners of the Treasury, and on any winding up the Association shall consent to the appointment of any liquidator who may be nominated by the said Commissioners.

9. True accounts shall be kept of the sums of money received and expended by the Association and the matter in respect of which such receipt and expenditure takes place, and of the properties, credits, and liabilities of the Association ; and, subject to any reasonable restrictions as to the time and manner of inspecting the same that may be imposed in accordance with the regulations of the Association for the time being, shall be open to inspection of the Members. The accounts of the Association shall be submitted quarterly to the Treasury for audit, or to any auditor or auditors to be appointed from time to time by the Lords Commissioners of the Treasury and the remuneration of such auditors shall be paid by the Association but the Lords Commissioners of the Treasury shall not in any way be required to see to the application of the funds of the Association or be responsible for their misapplication or for any of the debts or liabilities that may be incurred by the Association.

We, the several persons whose names and addresses are subscribed, are desirous of being formed into an Association in pursuance of this Memorandum of Association.

Signed by the Members of the Council and the Secretary.

Dated the 23rd day of September 1891.

ARTICLES OF ASSOCIATION.

(1.) For the purposes of registration the number of the Members of the Association is declared not to exceed ten.

(2.) These Articles shall be construed with reference to the provisions of the Companies Act, 1862, and the Companies Act, 1867, and terms used in these Articles shall be taken as having the same respective meanings as they have when used in these Acts.

(3.) The Association is established under the authority of the Lords Commissioners of the Treasury for the purposes expressed in the Memorandum of Association.

(4.) *Qualification of Members.*—The Association consists of the Members and the Secretary of the Meteorological Council.

(5.) *Admission of Members.*—The Members of the Meteorological Council are nominated by the President and Council of the Royal Society, with the exception of the Hydrographer to the Admiralty, who is a Member *ex officio*, and the Secretary of the Meteorological Council is appointed by the Council.

(6.) *Honorary Officers and their Elections.* — The Chairman is nominated by the Royal Society.

(7.) *Management of the Association.*—The business is to be managed by the Members of the Association, the remuneration of whom, if any, is to be such as may be sanctioned by the Treasury.

(8.) *Meetings, Proceedings, &c.*—The First General Meeting of the Association shall be held within four months after the registration of the Memorandum of Association. A General Meeting shall be held at least once in each year, in accordance with section 49 of the Companies Act of 1862. The Ordinary Meetings of the Association shall be held as the Council shall direct, and their proceedings shall be regularly recorded and printed.

The Association shall submit yearly a Report of its Proceedings to the Royal Society for presentation to Parliament.

(9.) *Accounts, Audit.*—The annual Estimates shall be submitted for approval to the Treasury, and the accounts, after examination by two Members of the Association, shall be sent to the Treasury for audit.

(10.) A notice may be served by the Association upon any Member, either personally or by sending it through the post as a prepaid letter addressed to such Member, at his registered place of abode.

Any notice, if served by post, shall be deemed to have been served at the time when the letter containing the same would be delivered in the ordinary course of the post, and in proving such service it shall be sufficient to prove that the letter containing the notice was properly addressed and put into the Post Office.

Signed by the Members of the Council and the Secretary.

Dated the 23rd day of September 1891.

APPENDIX II.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1892. The figures opposite to each show the total number of such Logs which they have returned to the Office during the period that they have been observing.

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Andersen, O. E.	5	S.S. "Longhirst."
Angus, T. S.	4	S.S. "Canton."
Atkinson, G. W.	3	S.S. "Kaisar-i-Hind."
Atkinson, S. P. H.	5	"Hollinwood."
Baxter, A. S.	6	"City of York."
Belding, R.	4	"Atlantic."
Bell, Richardson, R.N.R.	1	"Bootle."
Bett, Dr. W., R.N.	1	H.M.S. "Stork."
Blackburne, Mr. H. S.	10	S.S. "Rohilla."
Bolton, S. H.	13	S.S. "Baidar."
Bright, H.	6	"Beltana."
Broun, W. L., R.N.R.	1	S.S "Rohilla."
Cameron, J. G., R.N.R.	8	S.S. "Germanic."
Campbell, R.	8	S.S. "Elton."
Clarke, Comr. A. C., R.N.	5	H.M.S. "Espiègle."
Combe, Lieut. J. W., R.N.	1	H.M.S. "Penguin."
Conby, H. B.	1	"Garfield."
Couper, W.	4	"Clackmannanshire."
Cromarty, D. S.	5	"Kirkmichael."
Crotty, F. H.	5	"Evesham Abbey."
Dart, L. C.	12	"Semantha."
Davis, H.	2	"Alexander Lawrence."
Dawson, Comr. L. S., R.N.	11	H.M.S. "Rambler."
Day, Lieut. E. A., R.N.	3	H.M.S. "Dart."
De Horne, M.	3	S.S. "Carthage."
Dunbar, J. I.	21	S.S. "Arracan."
Dyke, H. W.	9	"Tenasserim."
Elliott, W., R.N.R.	3	S.S. "Clan Murray."
England, T.	11	"Glen Grant."
Exham, T. K., F.R.A.S.	11	S.S. "Tamar."
Field, Comr. A. M., R.N.	8	H.M.S. "Egeria."
Fraser, W. D.	5	"Michael Hutchinson."
Frederick, Lieut. and Comr. G. C., R.N.	11	H.M.S. "Dart."
George of Wales, H.R.H. Prince, Lieut. and Comr., K.G.	3	H.M.S. "Thrush."
Gray, John	15	S.S. "Hope."
Hepworth, M. W. C., R.N.R., F.R. Met. Soc.	9	S.S. "Port Adelaide."
Home, Dr. W. E., R.N., B.Sc.	3	H.M.S. "Thrush."
Janes, George	5	"Middlesex."
Kemp, A. H.	5	"Hudson."
King, J. W.	4	"Philomene."

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Martin, Walter, R.N.R. -	2	S.S. "German."
Merrett, J. (gunner) - -	2	H.M.S. "Egeria."
Millican, J. W. -	6	"Myrtle Holme."
Milne, W. F. - - -	9	S.S. "Maud."
Milner, W. H. - - -	12	S.S. "La Plata."
Mitchell, George - -	4	S.S. "Trinacria."
Molony, E. J. - - -	10	"British Merchant."
Moore, Comr. W. U., R.N. -	15	H.M.S. "Penguin."
Munn, L. A. - - -	5	S.S. "Spartan."
Murdoch, Peter - -	12	"Sierra Lucena."
Murray, A., Junr. - -	1	S.S. "Windward."
Nicholson, J. L - -	2	"Majestic."
North, W. G. - - -	16	S.S. "Plato" and S.S. "Panther."
Oliver, Lieut. G., R.N. -	1	H.M.S. "Penguin."
Owen, Owen - - -	2	"Cordelia."
Parson, G. F. - - -	11	"Earnock."
Peebles, R. - - -	15	"Bracadale."
Peterkin, W. - - -	1	"Khyber."
Pope, J. - - -	5	S.S. "Dee."
Pritchard, Lieut. C. E., R.N. -	6	H.M.S. "Espiègle."
Quaile, D. W. A. - -	5	"Craigerne."
Randall, W. - - -	13	"Laomene."
Rohde, H. P. R. - -	1	"Archdale."
Rosseter, W. L. - -	13	"Brenda."
Sargent, A. H. - -	6	"Pleione."
Scott, George - - -	7	"Holyrood."
Shearer, George - -	11	"Airlie."
Simpson, Alexander - -	14	S.S. "Australasian" and S.S. "Thermopylæ."
Simpson, Alexander - -	21	S.S. "Traveller."
Smyth, M. H., R.N. -	1	H.M.S. "Stork."
Spalding, T. F. - -	1	S.S. "Australasian."
Stewart, A. - - -	2	"County of Selkirk."
Streater, R. - - -	2	"Lutterworth."
Thompson, Lieut. H., R.N. -	5	H.M.S. "Rambler."
Thompson, J. E. - -	4	S.S. "Monarch."
Thomson, A.S., R.N.R., F.R.G.S.	12	S.S. "Silvertown."
Trenaman, R. W. - -	3	S.S. "Pascal."
Trott, S., F.R.Met.Soc. -	20	S.S. "Minia."
Walker, H., R.N.R. - -	15	S.S. "Aurania."
Walker, J. J., F.L.S. Ch. Eng., R.N.	2	H.M.S. "Penguin."
Wheaton, N. J. - -	13	"Eliza."
White, W. E., R.N.R. -	3	S.S. "Ormuz."
Wibmer, L. M., R.N.R. -	1	S.S. "Rohilla."
Wilson, J., R.N.R. - -	7	S.S. "Ethiopia."

Name of deceased observer printed in italics.

APPENDIX III.—Ships supplied and Documents returned during the year ending 31st March 1892.

The number of merchant ships supplied with standard instruments and meteorological logs during the above period was 95.

The number of meteorological logs, and documents from Foreign Stations, received during the same period, and registered in the Office, amounted altogether to 343, of which 171 were returned from ships, and the remainder from land stations, outside the British Isles.

List of Documents received from Foreign Land Stations.

Place.	Observer.	No. of Documents.	Nature of Observations.
Abaco (Bahamas)	C. A. Strachan, Lightkeeper	2	Lighthouse Register, 1891, January to December.
Akassa, Nun River, Niger Delta	Frank Russell, F.R.G.S.	2	Two observations daily, 1890, April to September and December.
Barbados (Commercial Hall)	- - - -	1	Lighthouse Register, 1889, May to 1890 October.
Barbados	Sergeant C. E. Phillips, M.S.C., Private J. H. Cummins, M.S.C., Sergeant J. Anderson, M.S.C.	3	Two observations, daily, 1891, July to September.
Beyrout (Lee Observatory)	R. H. West, M.A.	12	„ „ „ 1891, February to December; 1892, January, February.
Breaksea Island (King George's Sound).	G. C. Powney, G. Turner, and A. Robinson.	1	Lighthouse Register, 1871, January to December; 1872, July to December; 1882, January to June; 1888, October to 1889, April.
Brumana (Mt. Lebanon)	Thomas Little	11	Two observations daily, 1891, March to December; 1892, January and February.
Cape Juby (N.W. Africa)	Hubert Bray, M.R.C.S., L.R.C.P., W. H. E. Knaggs, and W. B. Silverwood.	12	„ „ „ 1891, January to May and July to December; 1892, January and February.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper	1	Lighthouse Register, 1891, January to June.
Cay Lobos (Bahamas)	Lightkeepers	2	„ „ 1891, January to December.
Cay Sal (Bahamas)	T. R. Thompson, Sen., Lightkeeper.	2	„ „ 1891, January to December.
Famagusta (Cyprus)	G. Eliades	8	Two observations daily, 1890, January to 1891 December.
George Town (British Guiana)	Robert Ward	9	„ „ „ 1891, February to December; 1892, January.
Gibraltar	Sergeant R. Scott, Med. Staff Corps.	12	„ „ „ 1891, February to December; 1892, January.

LIST of DOCUMENTS—*continued.*

Place	Observer.	No. of Documents.	Nature of Observations.
Inagua (Bahamas) - -	R. A. A. Espie, and J. W. Roberts, Lightkeepers.	2	Lighthouse Register, 1891, January to December.
Kaneohe (Oahu) - -	H. Cobb-Adams - -	5	Two observations daily, 1891, September to December; 1892, January, February.
Kyrenia (Cyprus) - -	M. Fuleiham and C. Natais -	8	Two observations daily, 1890, January to 1891 December.
Lagos - - - -	J. W. Rowland, Colonial Surgeon.	4	„ „ „ 1891, June, August to December; 1892, January.
Larnaca (Cyprus) - -	G. P. Voudiziano - -	8	„ „ „ 1890, January to 1891, December.
Limassol (Cyprus) - -	Luigi Béraud - -	8	„ „ „ „ „ „
Malden Island - - -	- - - -	1	Three observations daily, 1890, February to 1891, June.
Nicosia (Cyprus) - -	G. Stephen - - -	8	Two „ „ „ January to 1891, December.
Papho (Cyprus) - - -	E. A. Malliotis - -	8	„ „ „ „ „ „
Point King (King George's Sound).	S. Mitchell - - -	1	Lighthouse Register, 1870, January to December; 1871, May, to 1872, December; 1882, January to June; 1888, October to 1889, March; 1890, April, to 1891, November.
Principe Island (West Africa) -	G. R. Scovell - -	1	Two observations daily, 1891, February.
Sanchez (Samanà Bay) - -	(late) W. Reid, M.D. -	1	Four observations daily, 1886, January, to 1888, December.
Suva (Fiji) - - -	J. D. W. Vaughan, F.R.Met. Soc.	2	One observation daily. 1890, December; 1891, January.
Teneriffe (Sitio de Cullen) -	A. F. Perry - -	12	Two „ „ 1891, February to December; 1892, January, February.
Tobago - - - -	J. P. Tulloch, M.A., M.D. -	11	„ „ „ 1891, March to December; 1892, January.
Trinidad - - - -	J. H. Hart, Supt. Botanic Gardens.	12	„ „ „ 1891, February to December; 1892, January.
Watling Island (Bahamas) -	T. R. Thompson, jun., Lightkeeper.	2	Lighthouse Register, 1891, January to December.

LIST of DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Voyage.	Year.
Andersen, O. E.	S.S. Longhirst	New York	1891
" "	"	" "	1891-92
Anderson, Charles	S.S. Achilles	China, viâ Suez	1889
[1] Angus, T. S.	S.S. Canton	" "	1890-91
[2] Armstrong, B. G.	R.M.S. Elbe	Rio Janeiro	1891
[3] " "	"	Lisbon, East Coast of South America	1891-92
Asquith, W.	S.S. Deucalion	China, viâ Suez	1888-90
Atkinson, G. W.	S.S. Kaisar-i Hind	Calcutta, viâ Suez	1891
[4] " "	"	Shanghai, viâ Suez	1891
[5] " "	"	Calcutta, viâ Suez	1891-92
Atkinson, S. P. H.	Hollinwood	Melbourne	1891
Barker, R. J. M.	Barque Orion	New York, Australia, San Francisco	1890-91
Barwise, J.	S.S. Sarpedon	China, viâ Suez	1889-90
Batt, H. E.	S.S. Hector	" "	1888-89
Baxter, A. S.	City of York	San Francisco	1890-91
Belding, Rawtin	Barque Atlantic	Talcahuano	1890-91
Bell, Richardson	Barquentine Bootle	Natal, Mauritius, Adelaide	1890-91
[6] Benson, F. J.	Barque Elvira	Monte Video, Valparaiso, Cadiz	1891
Bolton, S. H.	S.S. Baidar	Between English Ports	1890-91
" "	"	Continental and English Ports	1891
Bright, H.	Barque Beltana	Adelaide	1890-91
" "	"	"	1891-92
Broun, W.L., R.N.R.	S.S. Rohilla	Home from Calcutta, viâ Suez	1891
Brown, R. J.	S.S. Titan	China, viâ Suez	1888-90
[7] Cameron, J. G., R.N.R.	S.S. Germanic	New York	1890-91
[8] " "	"	"	1891
[9] Campbell, Robert	S.S. Elton	India, viâ Suez	1890-91
[10] " "	"	" "	1891
[10] " "	"	Singapore and Cuba, viâ Suez	1891-92
Chrimes, H.	S.S. Sarpedon	China, viâ Suez	1888-89
[11] Clarke, Comr. A. C., R.N.	H.M.S. Espiègle	Coquimbo, San Francisco, Panama, and Pisagua	1890-91
[11] " " "	" "	West Coast of South America, Rio Janeiro	1891
Conby, H. B.	Garfield	Melbourne, San Francisco	1890-91
[12] Copp, B.	R.M.S. Moor	Cape Town	1891
[13] Couper, William	Clackmannanshire	San Francisco	1890-91
Cromarty, D. S., F.R. Met. Soc.	Barque Kirkmichael	Antwerp	1890-91
Crotty, F. H.	Evesham Abbey	Calcutta, Philadelphia, Japan, and San Francisco	1889-91
[14] Crutchley, W. C., R.N.R.	S.S. Kaikoura	Cape Town, New Zealand, Rio Janeiro	1891
" " "	"	" " " "	1891
Cuthbert, I., R.N.R.	S.S. Fifeshire	Australia	1891-92
Dart, L. C.	Barque Semantha	San Francisco	1890-91
[15] Davies, David	Andora	Mauritius, Calcutta	1890-91
Davis, Harry	Barque Alexander Lawrence.	Portland (Oregon)	1891
" "	" " "	Astoria	1891-92
[16] Dawson, Comr. L. S., R.N.	H.M.S. Rambler	Hong Kong, Red Sea	1891
De Horne, M.	S.S. Carthage	Australia, viâ Suez	1890-91
" "	"	Sydney, viâ Suez	1891
[17] " "	"	Bombay, viâ Suez	1891-92
[18] Dickinson, L. R.	S.S. Tagus	River Plate	1891
Dunbar, J. I.	S.S. Arracan	Rangoon, viâ Suez	1891
Dyke, H. W.	Tenasserim	Callao and Havannah	1890-91
Elder, Wm.	S.S. Nestor	China, viâ Suez	1889-90

	Captain's Name.	Ship.	Voyage.	Year.
	Elliott, Wm., R.N.R.	S.S. Clan Murray	Cape Town, Ceylon, and home viâ Suez	1891
	" "	" "	" " " "	1891–92
	England, Thomas	Barque Glen Grant	Quebec, Apalachicola	1891
19	Exham, T. K.	S.S. Tamar	East Coast of S. America	1891
	" "	"	" "	1891
20	Field, Comr. A. M., R.N.	H.M.S. Egeria	Darvel Bay, Sandakan	1891
20	" "	"	At Hong Kong and North Borneo	1891
20	" "	"	Sandakan, Singapore, Hong Kong	1891
21	Fordyce, William	County of Roxburgh	Calcutta	1891–92
	Fraser, W. D.	Barque Michael Hutchinson.	Rockhampton, Iquique	1890–91
	Frederick, Lieut. and Comr. G. C., R.N.	H.M.S. Dart	Australian Station	1890–91
22	" "	"	Tasmania, Sydney, Norfolk Island, New Hebrides	1891
23	George of Wales, Lieut. and Comr. H.R.H. Prince, K.G.	H.M.S. Thrush	Bermuda, Halifax	1891
23	" "	"	West Indies	1891
24	Gray, John	S.S. Hope	Greenland	1891
	Grier, John	S.S. Antenor	China, viâ Suez	1888–90
12	Griffin, E. J., R.N.R.	R.M.S. Moor	Cape Town	1891
	" "	"	"	1891
	Gruchy, H. de.	Sierra Ventana	Mauritius, Rangoon	1890–91
	Guthrie, W. E.	S.S. Bellerophon	China, viâ Suez	1888–89
	Hannah, W. T.	S.S. Glaucus	China, viâ Suez	1889–90
19	Hepworth, M. W. C.	S.S. Port Adelaide	Australia, viâ Cape and Suez	1890–91
19	" "	S.S. Port Denison	Las Palmas, Sydney viâ Suez	1891
19	Huddy, G. R.	S.S. Port Adelaide	Australia, viâ Cape of Good Hope	1891
	Hutchinson, I.	S.S. Orestes	China, viâ Suez	1888–89
	Jackson, Charles	S.S. Palamed	"	1889–90
	" M. H. F.	S.S. Telamon	"	1888–90
	" T. S.	S.S. Palinurus	"	1888–90
	Jamieson, D. E	S.S. Port Adelaide	Australia, viâ Suez	1891
	Janes, George	Middlesex	Chittagong	1890–91
	Jones, Henry	S.S. Telemachus	China, viâ Suez	1889–90
25	Keane, Lt. & Comr., H. J., R.N.	H.M. Gunboat Herald	On East Coast of Africa	1890–91
25	" "	" "	Zambesi and Shire Rivers	1891
25	" "	" "	" "	1891
	Kemp, A. H.	Barque Hudson	New Zealand	1890–91
	Kenward, John	Barque Savilla	St. Paul de Loanda	1890
	King, J. W.	Philomene	Melbourne, San Francisco	1890–91
	Lapage, W. P.	S.S. Anchises	China, viâ Suez	1890
	Low, John	Dundee	Sydney, San Francisco	1889–90
	" "	"	Philadelphia, Calcutta	1890–91
	Lowrison, G. M.	Eaton Hall	San Francisco	1890–91
	Martin, T. C.	Loch Tay	Melbourne	1891–92
26	Martin, Walter, R.N.R.	S.S. German	Cape Town	1891
26	" "	"	"	1891–92
27	Miller, A. T., R.N.	School Ship Conway	Off Birkenhead	1891
	Millican, J.W.	Barque Myrtle Holme	Adelaide, Cape Town, and Wallaroo	1890–91
19	"	" "	Adelaide	1891–92
	Milligan, John	S.S. Jason	China, viâ Suez	1888–90
	Milligan, Samuel	S.S. Stentor	" "	1889–90
	Milne, W. F.	S.S. Maud	Davis Straits	1891
	Milner, W. H.	R.M.S. La Plata	Brazil	1890–91
	" "	" "	"	1891
	Mitchell, George	S.S. Trinacria	Naples, New York	1891
	" John	Cape York	New York, Melbourne	1890–91
	Molony, E. J.	British Merchant	Port Townsend	1891–92

	Captain's Name.	Ship.	Voyage.	Year.
[28]	Moore, Comr. W. U., R.N.	H.M.S. Penguin	Australia, viâ Suez	1890–91
[29]	" "	" "	Off coast of West and North-West Australia	1891
[30]	Munn, L. A.	R.M.S. Spartan	Cape Town	1890–91
[31]	" "	" "	"	1891
	Murdoch, Peter	Sierra Lucena	Rangoon	1890–91
[32]	Murray, A., Jun.	S.S. Windward	Greenland	1891
	Nelson, R.	S.S. Menelaus	China, viâ Suez	1888–90
	Nicholson, J. L.	Majestic	Calcutta	1891
	Nish, H.	S.S. Cyclops	China, viâ Suez	1889–90
	North, W. G.	S.S. Plato	Hamburg	1890–91
	" "	S.S. Panther	"	1891
	" "	S.S. Plato	"	1891
	Owen, Owen	Barque Cordelia	New Westminster, Iquique, Talcahuano	1890–91
[19]	Parson, G. F.	Earnock	Melbourne	1890–91
	Pattman, R.	Loch Torridon	Calcutta	1890–91
	Peebles, R.	Bracadale	New York, Melbourne, San Francisco	1890–91
	Peterkin, William	Khyber	Calcutta	1891
[33]	Pope, James	S.S. Dee	West Indies	1890–91
	Pulford, I.	S.S. Patroclus	China, viâ Suez	1888–90
	Purdy, Thomas	S.S. Dardanus	" "	1888–90
	Quaile, D. W. A.	Barque Craigerne	Monte Video, Iquique, Portland (Oregon)	1890–91
	Randall, W.	Laomene	Calcutta and New York	1891–92
[34]	Rigaud, H. C.	S.S. Moselle	River Plate	1891
	Riley, James	S.S. Ajax	China, viâ Suez	1888–89
	Rohde, H. P. R.	Barque Archdale	San Francisco	1891–92
	Rosseter, W. L.	Brenda	New York, Calcutta, Demerara, Philadelphia	1891–92
[19]	Sargent, A. H.	Pleione	New Zealand	1891
	Scale, R. F.	S.S. Laertes	China, viâ Suez	1889
[19]	Scott, George	Holyrood	Calcutta, Mauritius, and New York	1890–91
[35]	" "	"	New York, Melbourne, and Calcutta	1891
	Scougall, H.	Barque Closeburn	Brisbane	1889–91
	Shearer, George	Airlie	Rio Janeiro, Adelaide	1890–91
	Simpson, Alexander	S.S. Australasian	Melbourne, viâ Cape Good Hope	1891
	" "	S.S. Thermopylæ	" " "	1891–92
	" "	Barquentine Traveller	Greenland	1891
[27]	Smith, J. H., R.N.R.	Training Ship Worcester	Off Greenhithe	1890–91
[36]	Smyth, Morris H., R.N.	H.M.S. Stork	Valetta to Suez, Red Sea, and Seychelles	1891
[37]	Spalding, T. F.	S.S. Australasian	To Australia, viâ Cape Town, and home, viâ Suez	1891
	Stewart, Alexander	County of Selkirk	Batavia, Chittagong	1891–2
	Streater, R.	Barque Lutterworth	Wellington	1890–91
	Symmers, John	Barque Inverurie	Rio Janeiro, Iquique	1890–91
[38]	Thompson, J. E.	S.S. Monarch	Coasts of British Isles	1889–91
[39]	" "	"	" "	1891–2
	Thompson, J. S.	S.S. Nestor	China, viâ Suez	1889
	" "	S.S. Hector	" "	1889–90
[19]	Thomson, A. S., R.N.R., F.R.G.S.	S.S. Silvertown	West Coast of South America	1890–91
[19]	" "	"	East Coast of South America	1891
[40]	Trenaman, R. W.	S.S. Pascal	Rio Janeiro, St. Lucia, New Orleans	1890–91
[41]	Trott, Samuel, F.R. Met. Soc.	S.S. Minia	Boston and Halifax	1891
[41]	" "	"	North Atlantic	1891–92
[42]	Wait, A. McLean	R.M.S. Tartar	Cape Town	1890–91
	" "	"	"	1891
[42]	" "	"	"	1891

Captain's Name.	Ship.	Voyage.	Year.
Walker, Henry, R.N.R.	S.S. Aurania - -	New York - - - - -	1891
" "	" - -	" - - - -	1891–92
[43] Ward, John - " -	Barque Glencaird -	San Francisco - - -	1889–90
Ward, W. - -	S.S. Lennox - -	Malta, New York, China, viâ Suez	1891
Webster, I. K. -	S.S. Prometheus -	China, viâ Suez - - -	1888–90
Wheaton, N. J. -	Barque Elisa - -	Frontera de Tobasco - -	1891
[44] White, W. E., R.N.R.	S.S. Ormus - -	Sydney, viâ Suez - - -	1891
[45] " " "	" - -	" " - - -	1891
[45] " " "	" - -	" " - - -	1891–92
[47] Wibmer, L. M., R.N.R.	S.S. Rohilla - -	Calcutta, viâ Suez - - -	1891
Wilding, James -	S.S. Agamemnon -	China and Japan, viâ Suez -	1888–89
[48] Williams, John -	Barque Elissa - -	Paysandu, Valparaiso, Marseilles -	1891–92
Wilson, John, R.N.R.	S.S. Ethiopia - -	New York - - -	1891
Wishart, J. T. -	Sierra Parima - -	Rangoon - - - -	1891
[49] Woolward, R.	S.S. Don - -	West Indies - - -	1890–91

In cases distinguished by marginal numbers the Meteorological Registers were kept chiefly by Officers, as follows:—

[1] Assisted by W. B. Palmer, 2nd Officer.
[2] Kept by Edward White, 4th Officer.
[3] Kept by Mr. Dagnel, 2nd Officer, and Mr. White, 4th Officer.
[4] Assisted by Messrs. Humphrey and Garwood.
[5] Assisted by Messrs. Smith and Hook.
[6] Kept by C. M. Redhead.
[7] Kept by 3rd Officer.
[8] Kept by F. R. Clarke, 3rd Officer.
[9] Assisted by C. Matthews, R. Knill, J. Morris, and J. Mason.
[10] Assisted by Clement Matthews and John Mason.
[11] Kept by Lieut. C. E. Pritchard, R.N.
[12] Kept by H. E. Butler, 4th Officer.
[13] Kept by H. W. S. Pritchard, Chief Mate.
[14] Kept by W. L. Paske, 4th Officer.
[15] Kept by J. H. Jones.
[16] Kept by Lieut. Henry Thompson, R.N.
[17] Kept by Hugh S. Crauford, 5th Officer.
[18] Kept by Edward Watt, 3rd Officer.
[19] Assisted by Officers.
[20] Kept by Joseph Merrett, Gunner.
[21] Kept by T. Robins and I. W. Anderson.
[22] Kept by Lieut. E. A. Day, R.N.
[23] Kept by W. E. Home, M.B., Surgeon, R.N.
[24] Kept by A. W. Crauford Lindsay, Surgeon.
[25] Kept by John Ottley, Surgeon, R.N.
[26] Kept by I. George, 3rd Officer.
[27] Kept by the Cadets.
[28] Kept by Lieuts. J. W. Combe, R.N., Gerald Oliver, R.N., and J. J. Walker, F.L.S., Chief Engineer.
[29] Kept by J. J. Walker, F.L.S., Chief Engineer.
[30] Kept by J. J. Brickhill, F.R.G.S., and W. F. Stanley.
[31] Kept by John Bernard, 4th Officer.
[32] Kept by Tom M. Parkin, B.A., Surgeon.
[33] Kept by Austin Jolliffe, 2nd Officer.
[34] Kept by William Anderson.
[35] Assisted by G. Devereux, 1st Officer, and A. Young, 2nd Officer.
[36] Kept by William Bett, Surgeon, R.N.
[37] Kept by A. Robb, 2nd Officer.
[38] Kept by A. F. Halpin, 3rd Officer.
[39] Kept by A. F. Halpin and G. Lever.
[40] Assisted by Mr. McGill.
[41] Kept by W. G. Squares, Chief Officer.
[42] Kept by C. E. Garnett, 4th Officer.
[43] Kept by D. Goldsmith.
[44] Assisted by C. L. May, Chief Officer, F. S. Symons, 2nd Officer, J. F. Rankin, 3rd Officer, and B. L. Gace, 4th Officer.
[45] Assisted by Messrs. May, Symons, and Gace.
[46] Assisted by Messrs. May, Coish, Rankin, and Gace.
[47] Kept by Andrew Jones, 5th Officer, assisted by H. S. Blackburne, 1st Officer.
[48] Kept by William H. Tait.
[49] Kept by D. McNab, 2nd Officer.

APPENDIX IV.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Barometers.	Aneroids.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1891, afloat - -	209	498	1,368	304	277	168	82
Issued since - -	78	131	279	50	48	19	13
	287	629	1,647	354	325	187	95
Returned since - -	72	107	273	57	46	17	19
April 1st, 1892, afloat -	215	522	1,374	297	279	170	76

INSTRUMENTS supplied, &c. for use at Naval Stations.

April 1st, 1891, in use -	68	65	278	28	27	5	12
Issued since - -	6	7	52	4	7	1	4
	74	72	330	32	34	6	16
Returned since - -	4	6	42	3	6	1	5
April 1st, 1892, in use -	70	66	288	29	28	5	11

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1892.

Afloat in Royal Navy - -	215	522	1,374	297	279	170	76
In use at stations - -	70	66	288	29	28	5	11
In store at M.O. - -	56	67	304	71	98	10	32
,, Chatham - -	12	15	26	6	8	—	13
,, Sheerness - -	8	8	36	8	9	3	9
,, Portsmouth -	9	41	14	4	9	3	5
,, Devonport -	20	39	43	13	14	4	16
,, Queenstown -	1	3	20	1	1	—	4
,, Gibraltar - -	2	3	14	3	3	—	4
,, Malta - -	7	11	46	12	12	2	17
,, Bombay - -	2	5	5	3	4	1	4
,, Halifax - -	3	9	19	3	5	—	14
,, Bermuda - -	6	15	43	7	9	2	15
,, Jamaica - -	7	3	31	2	2	—	—
,, Cape of Good Hope	4	6	29	5	6	2	4
,, Trincomalee -	5	5	19	4	4	—	4
,, Hong Kong -	11	19	42	11	10	—	17
,, Coquimbo -	5	4	14	1	1	—	19
,, Sydney - -	3	7	25	7	5	1	8
,, Esquimalt - -	8	8	20	3	1	—	—
Total, April 1st, 1892 -	454	856	2,412	490	508	203	272
Lost, &c. since April 1st, 1891	—	6	181	19	—	15	12

APPENDIX V.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Barometers.	Compasses.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1891, afloat - -	95	—	555	—	—	88	281
Issued since - - -	66	—	480	—	—	61	256
	161	—	1,035	—	—	149	537
Returned since - -	55	—	368	—	—	47	176
April 1st, 1892, afloat - -	106	—	667	—	—	102	361

INSTRUMENTS at Stations, viz., Telegraph Offices, Observatories, Fishing Villages, &c.

April 1st, 1891, in use - -	256	3	242	53	58	53	11
Issued since - - -	28	—	37	7	6	4	5
	284	3	279	60	64	57	16
Returned since - -	6	1	28	6	4	3	5
April 1st, 1892, in use - -	278*	2	251	54	60	54	11

DISPOSITION of Board of Trade Instruments on April 1st, 1892.

In merchant ships - -	106	—	667	—	—	102	361
In use at stations - -	278	2	251	54	60	54	11
In store at M.O. - -	40	4	128	6	18	45	50
At Liverpool Agency -	2	7	18	—	—	4	20
„ Aberdeen „ -	5	—	18	—	3	5	15
„ Glasgow „ -	6	—	29	—	—	4	17
„ Dundee „ -	16	—	26	—	—	14	34
„ Hull „ -	8	—	30	—	—	6	26
„ Southampton „ -	1	—	14	—	—	8	14
Total, April 1st, 1892 -	462	13	1,181	60	81	242	544
Lost, &c. since April 1st, 1891	3	—	138	4	2	17	67
Under repair - -	3	—	—	—	—	—	—

* Of these barometers 135 are lent for use of seafaring communities at fishing villages and ports.

APPENDIX VI.

List of Stations reporting Meteorological Observations to the Office by Telegraph on 31st March 1892, with the Names of Observers.

*†Sumburgh Head	Rev. W. Brand	Minister of Dunrossness.
*†Stornoway	J. Forbes	Nicolson Institution.
Wick	J. Sinclair	Watchmaker.
Nairn	Miss Penny	Schoolmistress.
*†Aberdeen	W. Boswell	Assistant at the Observatory.
Leith	W. Newlands	Telegraph Clerk.
*†Shields	J. W. Irvine	Do.
Spurn Head	G. Freeman	Lightkeeper.
†York	H. M. Platnauer, F.G.S.	Curator of Museum.
Loughboro'	W. Berridge	
†Ardrossan	J. W. Mayes	Telegraph Clerk.
†Malin Head	O. O'Doherty	Signalman, Lloyd's.
*†Mullaghmore	K. Kerr	Retired Coastguard Officer.
*†Belmullet	Miss M. J. Tolan	Telegraphist.
†Donaghadee	T. MacGowan	Postmaster.
Parsonstown	E. Haines	Assistant Observer at Lord Rosse's Observatory.
*†Holyhead	Capt. Richards	Keeper of Sailors' Home.
Liverpool	J. Hartnup, F.R.Met.Soc.	Bidston Observatory.
*†Valencia	J. E. Cullum, F.R.Met.Soc.	Superintendent of the Observatory.
†Roche's Point	W. Kennedy	Telegraph Clerk.
Pembroke	S. Blake	Lightkeeper.
*†Scilly	A. Hicks	Signalman.
Prawle Point	W. Hewitt	Coastguard Officer.
†Hurst Castle	G. G. Appleton	Lightkeeper.
†Jersey	J. Fisher	Station Master.
*†Dungeness	W. Batton	Assistant Lightkeeper.
†North Foreland	A. Cox	Signalman, Lloyd's.
*†London	F. Gaster, F.R.Met.Soc.	Clerk, Meteorological Office.
Oxford	W. Wickham	Radcliffe Observatory.
Cambridge	H. Todd	Observatory.
*†Yarmouth	G. T. Watson	Secretary, Sailors' Home.
‡Hawes Junction	W. H. Bunce	Station Master.

In addition to the above, reports are received daily from the following Continental Stations.

Station.	Authority.	Station.	Authority.
Haparanda	Meteorological Office, Sweden.	†The Helder	Bureau Central Météorologique, Paris.
Hernösand		Cape Gris Nez	
†Stockholm		†Brest (St. Mathieu)	
Wisby		Lorient (Île de Groix)	
Bodö	Meteorological Institute, Norway.	*†Rochefort (Ile d'Aix)	
†Christiansund		†Biarritz	
*†Skudesnaes		†Paris	
Færder		Belfort	
		Lyons	
		Nice	
†The Scaw	Meteorological Institute, Denmark.	Perpignan	
Fanö		Berlin	Cent. Met. Inst. of Germany.
Cuxhaven	Deutsche Seewarte, Hamburg.	Wiesbaden	
		Munich	
		Corunna	Observatory, Lisbon.
		†Lisbon	

Note.—The stations marked with an asterisk (*) report also at 2h. p.m.; and those with a dagger (†) at 6h. p.m.; Lisbon reports at 8h. a.m. and 4h. p.m.

‡ This station now reports by post only.

The station at the North Foreland was started January 1, 1892. At Leith Mr. Newlands succeeded Mr. Hay in May; at Spurn Head Mr. Freeman succeeded Mr. Watson in October.

Paris has ceased reporting at 6 p.m. on Sundays.

APPENDIX VII.

Report of Inspection of the Irish and Welsh Stations.

Telegraphic Reporting Stations.

Holyhead, visited July 25th.—The station is fairly satisfactory. The observer does not read the thermometers quite correctly as regards tenths of degrees. The rain-gauge required some slight repairs, which were ordered to be effected.

Roche's Point, visited July 28th.—The observations are very well taken. The thermometers were not clean, but there had been much dust about from building, and the weather had been very dry.

Valencia, visited July 31st.—The station calls for no remark as to the observations. I saw the builder about Westwood House, and gave instructions as to alterations, as authorised by Council. I directed builder to send in estimate for internal repairs and decorations to dwelling-house.

Parsonstown, visited August 4th.—The observer Haines is efficient, and the station is in good order.

Malin Head, visited August 10th.—The observer was absent, but his assistant, a very smart boy from Brow Head Signal Station (co. Cork) had learnt the duty of reporting very well.

Mullaghmore, visited August 11th.—The station is, as usual, in very good order. The observer wishes to be supplied with a self-recording aneroid, if possible.

Belmullet, visited August 18th. This station calls for no remark; it is satisfactory so far as is possible at such a place.

St. Ann's Head, visited December 9th.—I found this station in good order as usual. There is a prospect of a change of observer, as the present man expects promotion.

Weekly Weather Report Stations.

Killarney, visited July 29th.—This station calls for no remark.

Stations of the Second Order.

Dublin, Glasnevin, visited July 27th.—This station was, as usual, in very good order. The observer is careful.

Dublin, Phœnix Park, visited July 27th.—The station was in perfect order, but the observer was unfortunately absent. I saw the substitute, who was the former observer.

Dublin, Fitzwilliam Square, visited July 27th.—This station was, as usual, in perfect order. The thermometer and rain-gauge are not well exposed, as the garden is very confined.

Parsonstown, visited August 4th.—There is a new observer, Perry, a national school teacher. He seems to be efficient; he has only recently begun work.

Lissan, Co. Tyrone, visited August 5th.—Sir N. Staples has procured new instruments in place of those noted as defective on last inspection. The observations are very carefully taken.

Armagh, visited August 5th.—At this station there is a constant discrepancy between the Beckley and the ordinary gauge, which Dr. Dreyer is endeavouring to explain. He is going to try the effect of moving the ordinary gauge to a greater distance from the Beckley gauge, and therefore further out into the field.

Colebrooke, visited August 6th.—The station is in good order, but the observer is not careful enough about observing the weather in the intervals between the observations.

Londonderry, visited August 7th.—The station is satisfactory except as regards the position of thermometers and rain-gauge, but the only site available is a town garden.

Markree, visited August 12th.—This station is satisfactory. The assistant observer is shortly to be changed.

Currygrane, visited August 17th.—At this station the observer is new. He seems to read correctly, but I discovered some carelessness in entries. I hope that the notice taken will be sufficient to ensure care in future.

Arley Cottage, visited August 18th.—This is a new station; Major Somerset Maxwell has equipped it in a very complete manner. It is very good, and Major Maxwell has trained his assistant well.

St. David's, visited December 8th.—The station is in perfect order.

Tenby, visited December 10th.—This is a new station. The instruments have been procured by the Town Council, and the observer, Mr. Gower, is a local schoolmaster. The exposure in his garden is not good, as no grass is available. He takes his wind and weather reports from the Coast Guard log, and the sunshine recorder is on the Castle Hill in charge of the Coastguard.

Mr. Gower himself is very zealous, and I hope that he may improve the position of his instruments.

(Signed) ROBERT H. SCOTT.

STATIONS.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare Therm.	Remarks.
	°	°	°	°	°	
TELEGRAPHIC REPORTING STATIONS.						
Holyhead - -	−0·1	−0·3	−0·5	+0·2	−0·4	
Mullaghmore -	+0·0	−0·2	−0·2	+0·3	−0·5	
Malin Head - -	−0·2	−0·2	−0·2	−0·1	−0·3	
Belmullet - -	−0·4	−0·1	0·0	−0·4	—	No spare ther.
Parsonstown - -	−0·7	+0·1	−0·4	+0·3	—	No spare ther.
Roche's Point -	−0·5	−0·7	−0·3	−0·7	—	No spare ther.
Valencia - -	−0·6	−0·6	−0·3	0·0	—	
St. Ann's Head -	−0·2	−0·1	−0·1	−0·2	−0·2	
WEEKLY WEATHER REPORT STATIONS.						
Londonderry - -	−0·1	−0 1	0·0	+0·1	—	
Killarney - -	−0·1	−0 2	−0·1	+0·2	—	Min. ther. sluggish; bulb large

STATIONS OF THE SECOND ORDER, 1891.

STATIONS.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare Therm.	Remarks.
	°	°	°	°	°	
Armagh - -	−0·2	−0·2	−0·9	—	—	Grass min. + 0·9.
Brookeborough -	−0·5	−1·0	−0·2	−0·1	—	
Dublin (City) -	−0·5	−0·5	−1·0	0·0	—	
Dublin (Phœnix Park)	−0·2	−0·2	−0·2	+0·4	−0·4	Do. +0·2.
Edgeworthstown -	−0·7	−0·6	−0·6	+0·1	—	Do. −0·1, Kew standard −0·5.
Glasnevin - -	−0·4	−0·4	−0·7	+0·5	—	Grass min. +0·1.
Lissan - -	−0·1	−0·1	−0·1	+0·3	—	
Londonderry -	−0·1	−0·1	0·0	+0·1	—	
Markree Castle -	−0·1	−0·1	0·0	+0·4	—	Kew standard −0·1
Mount Nugent -	−0·1	−0·1	+0·9	0·0	—	Grass min. +0·5.
Parsonstown - -	−0·7	+0·1	−0·5	+0·3	—	Do. +0·5.
St. David's - -	−0·3	−0·5	+0·4	0·0	—	Do. −0·1.
Tenby - -	−0·1	0·0	+0·1	+0·2	—	Do. +0·1.

REPORT of INSPECTION of the ENGLISH STATIONS, 1891.

At the stations visited by me this year the thermometers employed were, as before, Negretti and Zambra's Nos. 13516 and B.T. 3158. These instruments have been once annually tested by me before use, and twice tested in 1891 (on the last occasion by Mr. Whipple and myself at Kew on November 23rd). It is not a little remarkable that the negative corrections applicable to No. 3158 have annually increased up to the present date, although the increase is now extremely slow; and in No. 13516 it was only in 1889 that the index error became stationary. During inspection tours the corrections determined in the early part of each year have been employed. Although I took the greatest care in comparing the instruments at the stations, I do not feel very well satisfied with the aspect of the results of the thermometer comparisons shown in the table.

Jersey, August 10–13.—The instruments at St. Aubin's were all in excellent order. The thermometer screen has been thoroughly repaired. I consider the reports from this station to be very good.

Considerable difficulty had arisen with regard to the continuation of the records of bright sunshine at Jersey.

Since the removal of the recorder to Fort Regent, where its exposure is perfect, the instrument has been attended to by some of the pensioners at the Fort, who have been paid for this work by the harbour-master. The Harbour Board having declined to defray his expense in this matter, I applied to General Ewart, C.B., Lieutenant-Governor of the Island, who received my request with much kindness, and who has since obtained from the bailiff of Jersey a copy of an Act of the Committee of the Defence of the Island, authorising the payment of 1*l.* for the present year as salary to the men who attend to the sunshine cards. The Lieutenant-Governor has also promised to make an application for the same sum at the end of 12 months.

In any event the sunshine records at Jersey will not be dropped.

Hurst Castle, August 16.—All the instruments at this station were found to be clean and in good order. The minimum thermometer gave somewhat high readings, and the wet bulb has never been correctly fastened to the porcelain; the observer always takes his readings from the degree-lines on the glass, but it may be desirable that the instru-

ment should be changed. The thermometers are read somewhat roughly by Mr. Appleton, but, so far as I have observed, he takes the readings of the barometers with accuracy.

I have in previous years mentioned the impossibility of getting a fair estimate of sea disturbance in rough weather at this station; and I may add that when a sea of "5" is reported with Westerly winds from Hurst Castle, a disturbance of "6" may generally be anticipated in mid-channel. The force of the winds reported from this station may be taken as roughly representing the wind-force about the middle of our south coast, but the direction is locally influenced by certain topographical features.

Scilly (*St. Mary's*), August 19 and 20.—The reports from this important station have improved with the increased experience of the observer; but I regret to say that he has hitherto failed in telegraphing extreme readings of the self-registering aneroid, which are of considerable value in the case of disturbances advancing from the south-west.

The duration of gales which arise or subside in the night is a sore subject with observers who are unable to study the anemograph. I found the anemometer at this station in good order, but I must admit that there is some difficulty in changing the paper during a gale, especially if the latter is accompanied by rain, a difficulty not appreciated by those unaccustomed to the task.

The observer reads barometers and thermometers quickly and accurately. I feel sure that there is no one else in St. Mary's who could undertake the whole work so well.

Prawle Point, August 23.—The observations at this station are good; the observer and his assistants read the instruments very correctly, and all the instruments were found by me in excellent order. The maximum thermometer read 0°·6 too low (uncorrected). No difficulty has been experienced during the past year with the minimum.

Dungeness, August 28.—The readings of all the instruments, as taken in my presence, with care that they should be taken independently, were thoroughly satisfactory. Yet it is certain that the barometric readings reported are occasionally faulty, the errors being probably clerical, or being occasioned by mistakes made between an observer coming on watch and one leaving duty. I called special attention to this carelessness. I found half of the bulb of the wet-bulb thermometer immersed in the water kept in the glass, the glass having been needlessly raised on a piece of wood since my last inspection, probably just before my arrival this year, and having been completely filled. This proved great want of intelligence on the part of the observers, to whom I gave such instructions as were necessary on the hygrometrical observations.

I think that the estimates of wind-force and of sea-disturbance at this station (*e.g.*, the extreme force 10 on the day of my visit) are quite correct.

Liverpool (Bidston Observatory), September 17.—I think that the observations at this station are carefully taken, and the reports continue to be satisfactory. The old corrections of the thermometers require no change. The barometric readings reported are now taken from the large standard, whose readings differed by only ·001 from the Adie's tube formerly in use.

North Shields, September 19.—The observer was not on duty at the time of my visit. I found the instruments in their usual order; that is

to say, the wet-bulb is very dirty, and the glass coated with metallic copper, while the other instruments are well attended to. The peculiar foulness of the air, characteristic of this station, is perhaps not so much due to collieries as to the smoke issuing from the factories in South Shields, and to the vomiting of immense quantities of the products of imperfect combustion from the steamers in the Tyne.

The instruments appear to be well read, and the reports to be promptly sent in.

York, September 19.—Inaccuracy is still noticed in the barometer readings reported from this station. The observer read the instrument correctly at the date of my visit; and possibly his occasional carelessness takes the form of that unpunctuality of which I have formerly complained. As much as 2°·9 of spirit were found in the upper end of the minimum. It seems extraordinary that the observer, who had for some time, as he stated, noticed the lowness of the readings, had not detected the detached spirit, visible at a distance of 3 or 4 yards. The continuity of the column was restored by one swing of the arm.

As I have previously reported, the station is inconveniently situated for observations of the wind.

Cambridge, October 26th.—Mr. Todd was again absent at the time of my visit. All the instruments were found to be in excellent order, as usual, at this station.

Yarmouth, October 27th.—I found the instruments at this station to be all in good order. The anemograph is at present satisfactory, but I think that the instrument will have to be taken down and repaired in the course of the next 10 or 12 months, at the latest. On the evening of the 26th and morning of the 27th the observer, Mr. Watson, was entirely occupied in providing for a ship-wrecked crew, so that I could not compare his readings with my own, or indeed have any conversation with him.

Loughborough, November 10th.—The observer has removed to 9, Forest Road, a position almost entirely outside the town, having gardens and open ground towards the north and west. The position is decidedly more favourable than that formerly occupied in Victoria Street, the garden being larger, the walls much lower, and there being no trees or obstructions in the immediate vicinity of the instruments. I have sent a small plan of the garden, which is a strip of ground running N.W. from the observer's house. The observer was occupied during the time of my visit. All the instruments were, as usual, in the most perfect order.

Second Order and Weekly Weather Reporting Stations.

Parkstone, August 24th.—This is a new second-order station. The observer, Mr. R. Hawkesworth Barnes, a gentleman of long experience in meteorological observations, employs a large assortment of instruments. The returns received are excellent, and the register kept by the observer, on the old system, of the amount and forms of cloud is more full and minute than any which I have met with elsewhere. The instruments are 199 feet above the sea-level. The thermometers and rain-gauges are in a garden surrounded by the thick fir trees characteristic of the neighbourhood; to the cutting off of the wind by which, the sharp ground-frosts noticed here are perhaps due. An anemometer is in use, but is necessarily much sheltered. All the instruments were in most excellent order.

Totland Bay, Isle of Wight.—The weather did not permit of my crossing the Solent at the time of my visit to Parkstone, Swanage, &c. The observer, Mr. Dover, informs me that he will have no difficulty in taking the 9 p.m. observations (hitherto not received from this new station), except in the summer season when he lets his residence, and may have a difficulty in getting the instruments attended to.

Leeson (*Swanage*), August 25th.—This is also a new station of the second order. It stands in wooded and undulating country, which on account of the weather could not be satisfactorily surveyed. The observer, Mr. H. Stillwell, was unfortunately absent from home on the day of my visit, and, except by comparison of instruments, I could obtain no information whatever. All the instruments were in good order, and their readings gave satisfactory results. The rain-gauge is well exposed. The Stevenson's screen is sheltered by trees in the afternoon. The station promises well.

Eastbourne, August 26th.—No alterations have been made here since my inspection in 1890. All the instruments were found to be in good order, with the exception of the rain-gauge, the injuries to which, owing to the stones thrown at it, had become very serious. A new gauge which I examined, and found to be a good instrument, was ready for erection, while a strong external iron case was being constructed for it; the instrument has since been put in position. It will be well that the rim should still stand only 6 inches above the ground.

The station, as previously reported, is a good one.

St. Leonards, August 27th.—This station has improved in one respect since it was visited in 1890, viz., the evening observations were recommenced in January. The observer read the thermometers well, but the barometer (through careless adjustment of the fiducial) incorrectly.

The wet-bulb was in a very dirty state. I removed the muslin and gave instructions to the observer.

Liverpool, September 17th.—I had not until now inspected this station as one of the second order. All the instruments, which include the Osler's anemometer, double windmill vanes, and the Robinson's cup-anemometer (the centres of whose 8 inch diameter cups move through 15 feet in each revolution) are kept in admirable order. The rain-gauges are unavoidably sheltered to a slight extent by the observatory buildings. The station, it need hardly be said, is an excellent one.

Seaham, September 18th.—Unfortunately, Mr. Aird was ill at the time of my visit, so that I could not give some instruction which was desirable as to the saturation columns in the Hygrometrical Tables. The assistant observer continues to be careful and attentive, except in the treatment of the wet-bulb, which was foul with copper salts, while the glass of the bulb itself has, like that at Shields, a deposit of metallic copper.

There is, I think, no doubt that the maximum readings at this station now require a larger correction than that hitherto applied.

York, September 19th.—It would, I think, be desirable if there could be another Stevenson's screen at this station. The instruments for the telegraphic reports and for the 9 o'clock readings are so crowded as to be somewhat difficult of manipulation; and, further, when they are read instantaneously on opening the screen, the readings of those near the roof of the screen differ from the readings of those near the floor, comparisons thus made being unsupported by comparisons of the instruments in water.

Sheffield, September 19th.—The instruments at this station are all in good order, and the station would form an excellent one of the second order if 9 p.m. observations could be obtained, which they cannot. There is a very good site for a sunshine recorder on the roof of the Art Gallery, and Mr. Howorth would have one established here if required.

Sudbury, October 27th.—The observers were absent for some days from home, and I obtained no information about the instruments. It is at present doubtful whether a second-order station can be established here, although one is much wanted in this neighbourhood. The observers, Messrs. Rawsom, are solicitors in Sudbury. They have undertaken to decide in a short time whether they will carry out the work.

Ketton Hall, October 28th.—This Weekly Weather reporting station is no longer under the immediate superintendence of Mr. Coventry, who left Ketton Hall in the year when the station was inspected by Captain Toynbee, and who has since lived at some miles' distance. The country round is undulating or moderately hilly. A sheet of artificial water borders on the south side the large garden, sloping down towards it, in which the outdoor instruments are kept; and this may partly account for the lowness of the temperatures experienced on clear winter nights at this station. The altitude of the ground above mean sea-level is 130 feet. The observations are taken by the head gardener, Mr. W. H. Divers, a most intelligent man, who has taken for many years great interest in weather observations, constructing barograms and thermograms from three-hourly eye observations. It will be seen from the Table that the corrections hitherto applied to the dry-bulb and to the minimum require considerable modification.

Rugby, November 9th.—The observations made at this station scarcely appear to me capable of so much improvement as to make the returns available for publication. Two of the masters and one of the boys undertake the observations in term time; but the work falls, *ipso facto*, upon Mr. Kirk, the gardener at the observatory gardens, who takes the readings rather roughly. Evening observations of the barometer are not sent and are rarely taken. The instrument is in a bad position, on the wall of a dark passage leading from the school quadrangle to some lecture rooms.

Tealby (*Market Rasen*), November 11th.—I have hopes that this will be a useful second-order station. The observer read the instruments correctly, and takes interest in the work; his time, however, appears to be much occupied in other duties. He has suffered from illness during the spring and summer, and has only commenced sending in returns in July last. As mentioned in my last year's report, the situation of the thermometer screen is not unexceptionable. At the date of my visit, during the storm prevailing at the time, there was a leakage in the roof of the screen, causing the dry bulb to give inaccurate readings; this I ordered to be immediately remedied. There is no good situation for the rain-gauge (an unverified instrument, which, however, appeared to give accurate measurements) to be found on the observer's grounds. I still think that the rainfall records should be obtained from the instrument kept by Mr. Jevons at Market Rasen, if such an arrangement can be made.

Sutton Coldfield, November 14th.—As at the last-mentioned station, the observer has suffered greatly in health from the results of influenza in the spring, and has been obliged to leave all the work of observation

to his clerks at the Borough Surveying Office. The returns are very much in arrear. The instruments were all in good order. The observer's business precluded him from taking readings with me, although I had selected a Saturday afternoon for my visit. His nephew, who is learning to take the readings, did not set the barometer correctly.

I think that if assistance in reductions can be given to the observer the returns will, after this visit, improve, and there is no reason why the station should not be a permanent one.

Chilworth, November 24th.—The observer, Mr. C. Bell, was absent at the time of my visit, and there was no one on the premises able to show me the barometer. The thermometer screen I found to be placed on sandy earth instead of on turf. The thermometer read correctly. The wet-bulb was not quite correctly mounted. These instruments are a good deal sheltered by the house. The rain-gauge, on the other hand, has a complete exposure, but it consists of a mere funnel placed on a glass bottle, which was greatly inclined, and I had no access to the measuring-glass. The house stands on a moderate eminence, in a rather richly wooded and undulating country.

Epsom, November 25th.—The former observer, Mr. Jackson, succumbed to typhoid fever in the vacation, and his successor has recently left the College. Mr. Mayo, together with another of the elder students, now undertakes the observations. The thermometers do not appear at present to be very accurately read, and the same remark applies to a less extent to the barometer.

Speaking generally, the instruments at this station are very well situated.

The following table, similar to those which I have previously submitted, gives the corrections of the instruments, &c. at the stations inspected last year.

(Signed) W. Clement Ley.

STATION.	THERMOMETERS.											STATION.
		Dry Bulb.		Wet Bulb.		Maximum.		Minimum.		Spare.		
Name of Station.	Temperature of Water.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Correction to reduce to Inspector's Standard.	Correction hitherto applied.	Correction to reduce to Inspector's Standard.	General Condition.	Name of Station.
	°	°	°	°	°	°	°	°	°	°		
Cambridge	51	0·0	−0·1	−0·1	−0·2	−0·2	−0·8	0·0	−0·4	—	A	*Cambridge.*
Dungeness	61	−0·1	—	−0·2	—	0·0	—	0·0	—	—	B	*Dungeness.*
Hurst Point	63	−0·4	—	−0·3	—	−0·2	—	−0·7	—	—	A	*Hurst Point.*
Jersey	64	−0·3	—	0·0	—	+0·1	—	+0·2	—	—	A	*Jersey.*
Liverpool	60	−0·05	?	−0·15	?	0·0	?	0·0	?	—	A	*Liverpool.*
Loughborough	47	−0·05	—	+0·05	—	0·0	—	+0·05	—	0·0	A	*Loughborough.*
North Shields	61	0·0	—	0·0	—	0·0	—	+0·3	—	—	A	*North Shields.*
Prawle	59	−0·3	—	−0·3	—	+0·6	—	0·0	—	−0·4	A	*Prawle.*
Scilly	54	−0·2	—	−0·1	—	−0·6	—	0·0	—	−1·1	A	*Scilly.*
Yarmouth	54	−0·05	—	−0·2	—	−0·1	—	+0·1	—	—	A	*Yarmouth.*
York	60	−0·3	—	−0·3	—	−0·2	—	+0·8	—	—	B	*York.*
Chilworth	47	−0·05	+0·1	−0·1	0·0	−0·2	0·0	0·0	+0·1	—	B	Chilworth.
Eastbourne	60	−0·1	0·0	−0·2	0·0	−0·1	−0·1	−0·2	0·0	−0·9	A	Eastbourne.
Epsom	46	0·0	−0·1	+0·1	0·0	+0·6	—	+0·3	—	—	B	Epsom.
Liverpool	60	−0·05	—	−0·15	—	0·0	—	0·0	—	—	A	Liverpool.
Market Rasen	50	0·0	−0·1	−0·1	−0·1	−0·7	−0·9	+0·7	+0·7	—	B	Market Rasen.
Parkstone	62	−0·1	−0·3	−0·1	−0·1	+0·1	—	0·0	—	—	A	Parkstone.
Rugby	44	−0·1	—	−0·1	—	+0·2	—	+0·3	—	+0·2	C	Rugby.
St. Leonards	67	−0·3	−0·3	−0·4	−0·4	−0·1	+0·2	0·0	0·0	—	C	St. Leonards.
Seaham	57	−0·05	0·0	0·0	0·0	+0·8	+0·5	+0·5	+0·5	—	A	Seaham.
Sheffield	58	−0·1	0·0	−0·2	−0·1	+0·1	0·0	+0·2	−0·1	—	A	Sheffield.
Stamford	50	−0·4	+0·1	0·0	0·0	−0·3	−0·2	−0·2	+0·2	+0·1	A	Stamford.
Sutton Coldfield	46	0·0	−0·1	0·0	−0·1	+0·1	0·0	−0·2	0·0	−0·2	C	Sutton Coldfield.
Swanage	65	−0·15	0·0	−0·2	0·0	+0·05	0·0	−0·05	−0·1	—	A	Swanage.
York	60	−0·3	−0·1	−0·3	−0·1	0·0	−0·1	+0·1	—	—	B	York.

REPORT of INSPECTION of the SCOTTISH STATIONS for 1891.

The mercurial Standard Barometer No. 690 was used on this year's tour of inspection of stations. It was compared before and after inspection with a standard in Edinburgh, which shows that no change had occurred during inspection. The barometers were found to be in good order, and the observations made with satisfactory care and accuracy. The following table gives the results of the comparisons of the station barometers with the Standard Barometer No. 690.

TABLE I.

Stations.	Inspector's Standard, corrected.	Not corrected.		Remarks.
		Reporting Barometer.	Check Barometer.	
	ins.	ins.	ins.	
Ochtertyre - -	29·678	29·664	—	
Laudale - - -	—	29·756	29·740	Check barometer in flat above.
Fort William - -	29·999	29·994	—	
Callton Mor - -	29·931	29·900	—	
Rothesay - - -	29·953	29·956	—	
Ardrossan - - -	29·980	29·972	—	
Pinmore - - -	29·726	29·730	—	
Glenlee - - -	29·690	29·690	—	
Cargen - - -	29·820	29·760	—	See Inspection Notes.
Stornoway - -	29·077	29·070	29·068	
Nairn - - -	29·149	29·144	29·146	
Fort Augustus - -	29·393	29·385	—	
Lairg - - -	29·577	29·560	—	
Dunrobin - - -	29·973	29·976	—	
Wick - - -	29·250	29·244	29·198	Check barometer in higher situation in house.
Deerness - - -	29·158	29·168	—	
Dunrossness - -	29·772	29·763	29·772	
Aberdeen - - -	30·057	30·060	30·057	
Braemar - - -	28·770	28·754	—	
Dundee - - -	29·920	29·910	—	
Hawick - - -	29·054	29·056	—	
Wolfelee - - -	29·163	29·164	—	
Marchmont - -	29·520	29·520	—	
Glasgow - - -	29·102	29·102	—	
Clober - - -	28·766	28·748	—	
Edinburgh - - -	28·996	28·960	—	
Leith - - -	29·293	29·294	29·294	

The various thermometers in use at the stations were compared with Standard Thermometer No. 4433. The results of the comparisons are detailed in the following table, which gives the corrected readings of the standard thermometer, the errors of each instrument, and the conditions under which the comparisons were made.

TABLE II.

Stations.	Standard No. 4433, corrected.	Dry Bulb.	Wet Bulb.	Spare Thermometer.	Max. Thermometer.	Min. Thermometer.	Time in Water in Minutes.	Change of Temperature.
	°	°	°	°	°	°		°
Ochtertyre - - -	60·2	·0	·0	—	+0·1	·0	65	Uniform
Laudale - - -	59·4	+0·2	+0·2	—	+0·1	+0·3	120	+0·3
Fort William - - -	60·0	+0·2	+0·2	—	0·0	−0·1	150	+0·6
Callton Mor - - -	59·6	+0·1	0·0	—	+0·8	−0·5	60	−0·3
Rothesay - - -	59·8	0·0	0·0	—	+0·2	−0·4	75	+0·4
Ardrossan - - -	60·0	+0·2	+0·3	—	−0·3	−0·2	95	+0·2
Pinmore - - -	58·3	+0·3	+0·5	—	−0·1	+0·1	90	+0·3
Glenlee - - -	61·0	+0·3	+0·2	—	−0·3	0·0	60	Uniform
Cargen - - -	66·2	+0·4	+0·4	—	0·0	−0·2	70	+0·5
Stornoway - - -	57·9	+0·5	+0·5	—	−0·4	−0·5	180	+0·4
Nairn - - -	58·3	+0·7	+0·7	—	0·0	−0·1	60	Uniform
Fort Augustus - -	55·8	0·0	0·0	—	+0·1	−0·4	120	Do.
Lairg - - -	54·8	+0·2	+0·1	—	+0·1	+0·1	60	Do.
Dunrobin - - -	55·8	−0·6	−0·6	—	0·0	−0·4	90	Do.
Wick - - -	55·6	+0·5	+0·4	—	−0·4	−0·1	45	Do.
Deerness - - -	56·2	0·0	0·0	56·9	+0·2	0·0	120	+0·5
Dunrossness - - -	57·4	+0·4	+0·5	—	+0·1	0·0	165	−0·5
Aberdeen - - -	56·2	+0·3	+0·3	—	+0·3	+0·2	100	Uniform
Braemar - - -	56·1	+0·4	+0·5	—	−0·1	−0·2	110	+0·3
Dundee - - -	54·4	+0·4	+0·4	—	+1·4	−0·4	50	Uniform
Hawick - - -	59·9	0·0	0·0	—	−0·1	+0·1	150	Do.
Wolfelee - - -	53·2	−0·2	−0·3	—	+0·2	−1·0	120	+0·2
Marchmont - - -	52·7	−0·1	−0·2	—	0·0	0·0	180	Uniform
Glasgow - - -	47·9	—	—	—	−0·1	0·0	75	Do.
Clober - - -	48·3	+0·9	+0·9	—	+0·4	−0·2	180	−0·6
Edinburgh - - -	51·2	0·0	+0·1	—	0·0	0·0	105	+0·2
Leith - - -	50·2	+0·1	+0·3	—	+0·1	−0·4	60	Uniform

The only cases of the minimum thermometer being out of order occurred at Wick and Dunrossness, which are described in the following notes.

Hygrometers.—The observations of the dry and wet bulbs made immediately on opening the Stevenson Screen at all the stations show that the hygrometers are very well attended to. The smallest difference—Dry 61°·8, Wet 61°·5—was noted at Pinmore, immediately after exceedingly heavy rain when the air and all objects near were drenching wet.

NOTES on the STATIONS.

Ochtertyre, July 31st, 1891.—The instruments are all in excellent order and the observations accurately and intelligently made.

Laudale, August 4th.—The instruments are in excellent order and are observed with care and accuracy.

Fort William, August 5th.—The instruments are in admirable order; the observations are punctually and correctly made.

Poltalloch, August 6th.—The instruments are well attended to and the observations are made with much care and intelligence.

Rothesay, August 7th.—The instruments are in thoroughly good order. Mr. Kay was from home at the time of my visit, and during his absence the observations are made by Mrs. and Miss Kay.

Ardrossan, August 7th–8th.—The instruments are in very good order and the observations are made with considerable intelligence, and a

good deal of interest appears to be taken in them. I gave instructions to resume at once the 10 p.m. or late daily, observation.

Pinmore, August 8th.—The condition in which the instruments are and the care and correctness shown in making the observations are all that can be desired. The vane on Pinmore House, which is kept in good order, is used, along with smoke, trees, &c. in making the observations of wind.

Glenlee, August 10th.—The instruments are in remarkably good order and the observations are made conscientiously and with much care.

Cargen, August 11th.—The instruments are in good order and the observations are made with great care and intelligence. Mr. Dudgeon personally gives much attention to the instruments, the observations, and the schedules. Shortly before my visit the barometer had been accidentally broken; but in the meantime, till the new one arrived from Edinburgh, the one in the hall, which of its kind is a good one, with error of $-0{\cdot}060$ inch, is used.

Stornoway, August 25th.—The thermometer screen with enclosing railing were ordered to be repaired, otherwise the instruments are in remarkably good order and the observations are evidently made with conscientiousness and care. I specially drew Mr. Forbes and assistants' attention to the observations of wind direction, and recommended that the readings, after entry in the book, be compared with the observations.

Nairn, August 26th.—Some slight repairs are ordered for the thermometer screen, but with this exception the instruments are in very good order and the observations are made with care. The reductions of the barometer for the previous three months were scrutinized and one error was discovered, the reading of July 28th at 8 a.m. should have been $29{\cdot}653$ and not $29{\cdot}613$ as had been wired.

Fort Augustus, August 28th.—The instruments are all in excellent order and the observations are made with much intelligence and with the greatest care. The Rev. Adrian Weld Blundell became observer after the death of Father Cody. It is proposed to add observations of ozone and underground temperature, and possibly also observations of electricity.

Lairg, August 29th.—Shortly after last inspection a new rain-gauge was got and placed in a good situation. The instruments are all in good order. During the absence of Mr. Young the barometer was in the house of Sergeant Instructor Rae, of the volunteers, who was for the time acting as observer.

Dunrobin, August 29th.—As the scales of the dry and wet bulb thermometers have become indistinct a new hygrometer has been recommended, otherwise the instruments were in good order and the observations continue to be very carefully observed.

Wick, August 31st.—An air-bubble about $0^{\circ}{\cdot}5$ was in spirit column, which Mr. Sinclair was aware of, but thought it due to the instrument being a defective one. If was put right. A new stand for the Stevenson screen was ordered and the whole to be painted. The check barometer which had recently been repaired, was in good order, as were also the other instruments, with the above exceptions. The observations are carefully and very fully and intelligently made.

Deerness, September 2nd.—The instruments were removed from Stennis to Deerness three months ago. They have been remarkably

well placed in their new positions, the positions obtained for the anemometer and sunshine recorder being singularly good. All are in good order and the observations are made with great care and intelligence.

Dunrossness, September 4th. — Orders were given to repaint the Stevenson screen and posts. A small portion of spirit was lodged at the top of the tube of the minimum thermometer, which is so constructed that the observer could not have been expected to have detected it. It was put right with Mr. Braid's assistance. It is probable that the error commenced with the use of the instrument a year since, and that the error has been about a degree throughout. An excellent position for a sunshine recorder in front of the manse was selected and directions given as to the placing of it. Otherwise the instruments are in excellent order and the observations are punctually and intelligently made.

Aberdeen, September 8th.—Everything at this station is in excellent order and the observations are made with much intelligence.

Braemar, August 7th.—All the instruments are in admirable order and the observations are carefully and accurately recorded.

Dundee, September 8th.—The instruments continue to be well attended to and the observations are made with care and accuracy.

Hawick, October 1st.—The instruments are all in remarkably good order and the observations are made with much interest and intelligence. It is intended to add to the monthly sheet observations of wind, cloud, and weather. The observations of wind, however, cannot, owing to the deep confined valley of the Teviot here, be accepted as representing the general directions of the wind in this part of Scotland.

Wolfelee, October 2nd.—The instruments are well attended to and the observations are made with intelligence and conscientiousness.

Marchmont, October 3rd.—The instruments are particularly clean and well attended to and the observations are made with great fulness and intelligence.

Glasgow, October 15th.—The instruments continue to be kept in very good order, and the observations are accurately made.

Clober, Milngavie, October 16th.—Since last year's inspection considerable changes have been made. The shed originally designed for the thermometers has been removed and a Stevenson screen placed on the same site. The rain gauge has been removed from this site and placed in the open field near the anemometer. Experiments are being made with an anemometer sent by Mr. Bryson, of Edinburgh, with regard to the registration of the direction of the wind. The instruments, and their exposures, are now uniform with those at the Council's other stations; they are all in very good order, and Mr. Bertram makes the observations with much enthusiasm and intelligence.

Edinburgh, October 19th.—Since last inspection a new Stevenson screen has taken the place of the one previously used which was a modified Stevenson. There is also a storm rain gauge and a duplicate set of the other instruments at this station. The instruments are all in very good order and the observations are made with care and accuracy.

Leith, October 20th.—The instruments are in good order, and the observations are carefully and correctly made. Mr. T. Richardson, the new assistant, observes and makes up the daily weather report.

The Observatories.—The comparison of their barometers with the standard has been already given in first Table of this Report. In each case the maximum and minimum thermometers in the special screens of the observatories were compared with the standard with this result:—

	Standard No. 4433.	Maximum Temperature.	Minimum Temperature.
Fort William - - - -	60°·0	60°·0	59°·7
Aberdeen - - - -	56·2	56·1	56·1
Glasgow - - - -	47·9	47·8	47·9

At Fort William the registering rain-gauge, which had not been acting satisfactorily, is now in good order.

The instruments, registrations, and observations at each of these observatories are very satisfactory.

(Signed) A. BUCHAN.

REPORTS on INSPECTION of OBSERVATORIES, &c.

I.—SELF-RECORDING OBSERVATORIES.

Falmouth Observatory.—Visited August 8th to 14th, 1891.

The self-recording meteorological instruments were examined, and all the clocks and lenses cleaned as usual. I found all parts carefully kept and in excellent order.

The anemograph bearings were found well lubricated, the asbestoline applied last year, with the exception of the top velocity-bearing, which had run dry, having proved a first-rate lubricant.

The rain-gauge pencil was examined and found to be an ordinary office blacklead.

I also very carefully tested the action of the float, and found its capacity was correct, and that the discharging siphon always acted properly.

I also looked into the question of collecting the water received by the gauge, but found that in consequence of the large amount of the maximum daily fall occurring at Falmouth it would be necessary to provide a vessel of considerable capacity to contain a fall of nearly 2 inches of rain, thereby necessitating the excavation and walling in of a large chamber. I did not think I should be justified in incurring the outlay such an operation would entail, and accordingly did not have it made.

I found the values of the thermograph lines to be as follows:—

Upper zero lines dry - - - - -	82°·5
„ „ wet - - - - -	81·0
Lower zero lines dry - - - - -	16·0
„ „ wet - - - - -	17·8

The orientation of the anemograph was verified and found correct, and is recorded on sheet No. 225, duly forwarded to the Meteorological Office.

Radcliffe Observatory, Oxford, visited August 17th.—Dr. Stone was absent at the time of my visit to the observatory, but I received every attention at the hands of Mr. Wickham, the chief assistant.

I found all the instruments were working in good order, but cleaned the lenses and oiled the clocks.

I had a new suspension spring fitted to the pendulum of the Beckley gauge clock, which broke when dismounted for oiling.

The thermometers were all compared with my standard, with the following results :—

Dry, No. 576	°0·0
Wet, No. 575	−0·3
Max., No. 356	−0·2
Min., No. 363	+0·2

Stonyhurst Observatory, visited September 10th, 1891.—The instruments at this observatory were working under the charge of the Rev. W. Sidgreaves, all being in good order. The anemograph by Beck, however, is beginning to show signs of wear, and will probably require the replacement of several of its more exposed parts before many more years have elapsed.

The thermometers were compared with my standard K.S. 682, and found to have the following corrections :—

Dry, No. 619	°−0·3
Wet, No. 325	−0·4
Max., M.O. 439	−0·3
Min., M.O. 501	+0·4

The Beckley rain-gauge was found to be quite correct. My attention having been directed by the Meteorological Office to the exposure of the sunshine recorder, which is only raised 3 to 4 feet above the ground, I noted the following points as regards the summer-houses which it is thought may possibly throw shadows upon it. The pyramidal roof of the western pavilion subtends at the glass sphere, the horizontal angle from 17° to 30° south of west, through altitudes from 3° to 10° above the horizon, and the similar roof of the eastern house from 4° to 16° south of east, and shades also from 3° to 10° above the level plane.

II.—Anemographs.

The anemograph at Fleetwood was visited September 7th to 9th.

It was found to be in first-rate order, the loose ties of the fan were soldered up, all bearings were cleaned, and I replaced the old oil in the cups with asbestoline. I oiled clock and cleaned its escapement, which is in good order. Some slight repairs of the case, which are necessary, were ordered to be made, and the external parts were painted during my visit. The orientation was duly examined and the sheet marked.

The pavilion containing the instrument is now closed to the public, and the curves, together with two copies of the Daily Weather Report, are exhibited and consulted in the public library of the town.

Yarmouth anemograph.—This was found in good action and its bearings well oiled, but the following points were noted :—

The fans were found much corroded and worn, and new ones should be prepared, and if sent down with spindles made in accordance with the gauge-piece I forward to the Office with this report, could be put on by the local workman employed by Mr. Watson to oil and paint the instrument.

The cups are all fitting properly with the exception of one, which was broken away a long while ago: the iron tie applied last year was renewed.

The recorder was in good order, the clock was oiled, and the slides and fittings cleaned. The orientation was examined, and the marked curve was forwarded to the Meteorological Office.

The thermometers, which are in a wall-screen painted green, were compared and found to read corrected as follows:—

Dry, B.T. 1542	+0°·1
Wet, B.T. 515	−0·5
Max., M.O. 21	−0·4
Min., M.O. 2480	+0·7

The maximum is not divided on its stem. The rain-gauge is in good order.

Plymouth, the Biological Laboratory.—I visited this institution on my return from Falmouth, at the request of Mr. Dickson, in order to view the site on which he intended erecting the screen, in which he was about to set up the instruments formerly used by Dr. Merrifield.

I considered it a very suitable and convenient locality, and I understand that since my visit the thermometers have been placed there, and all particulars duly forwarded to the Meteorological Office. The thermometers were verified whilst in the possession of Dr. Merrifield, and Mr. Dickson has since compared them with a Kew standard he purchased from Kew recently, and finds the values correct.

(Signed) G. M. Whipple.

Glasgow, visited September 29th to October 1st.—At this observatory the instruments were all working satisfactorily, but the barograph and thermograph clocks required cleaning. This was accordingly done and new lines attached to the clock weights, also the lenses, mirrors, &c., were attended to.

During the night of September 29th the barograph clock repeatedly stopped, and on examining it the next morning one of the driving wheels was found bent. It was rectified, and since then the instrument has gone well.

The zero lines of the thermograph were changed to the winter position, and the various thermometers compared with Kew Standard 682 at 52° Fahr. and found to require the following corrections:—

Dry Standard No. 550	−0°·1
Wet „ No. 472	−0·45
Maximum, No. 58,846	+0·1
Minimum, No. 63,942	−0·1
Grass minimum, No. 59,003	−0·1
Barograph thermometer (no number)	−0·8
Thermometer attached to the standard barometer	−0·5

The anemometer was dismounted and cleaned and fresh oil applied to all the bearings. One of the fan blades was found loose; this I had resoldered before again erecting the instrument.

Afterwards the orientation was duly examined, and the sheet containing the result accompanies this report.

As regards the self-recording rain-gauge; it was in very good order, and did not require any special attention.

The sunshine recorder was examined on the morning of October 1st, when it was found that the glass sphere had slipped off its pedestal and

was resting against the cusps of the metal bowl; in consequence the instrument was not recording, although the sun was shining brightly at the time. From an inspection of the cards it was evidently in proper action on September 27th, but in the interval the weather, according to the meteorological register, was chiefly overcast, so that very few hours of sunshine were really lost. In order, however, to prevent a recurrence of this accident, I thought it advisable to have the glass ball cemented down to its support, and Professor Grant gave instructions for this to be carried out.

Fort William, inspected October 3rd–5th.—Found all the instruments here in good order. The barograph and thermograph clocks were taken entirely to pieces and cleaned, and the lenses, condensers, and mirrors wiped.

The zero lines were changed to the winter position, and the standard thermometers were examined by means of Kew Standard No. 682 at 60° and the following corrections determined:—

Dry Standard, No. 671 - - - -	0°·0
Wet „ No. 682 - - - -	−0·2
Maximum, No. 1032 - - - - -	+0·1
Minimum, No. 1322 - - - - -	+0·3
Barograph thermometer, K.O. 690 - - -	−2·1
Thermometer attached to the standard barometer, No. 72,222 - - - - -	−0·1

NOTE.—As the reading of the minimum thermometer was rather low, I dismounted the tube from its scale and gently heated the upper end by means of a lamp. After standing the tube in a vertical position for some three hours it was again tested at 60° and found to require a correction of +0°·1, thus indicating a rise of 0°·2.

The Beckley rain-gauge was found to be in good order, and the clock only required oiling.

Deerness, Orkney, October 8th–9th.—The anemograph at this station was shifted from Stenness in April last under the direction of Messrs. Fortescue and Spence, and is now entirely in charge of the last-named gentleman. The instrument has been very carefully erected, and is now distant about 400 yards from the school house, the position being an excellent one, with an uninterrupted exposure from all points of the compass. The hut rests on a stone basement rising some 3½ feet above the ground, and the cups are about 17 feet from the surface of the ground.

Although the anemograph was working well at the time of my visit, I had the cups, shafts, and fans dismounted and cleaned, and all the bearings were afterwards lubricated with asbestoline. An old crack in one of the cups had given way, but this I had rivetted, and the external parts of the instrument painted before putting up again.

Mr. Spence takes a considerable interest in the work, and is fully aware of the importance and necessity of keeping the bearings well oiled.

The orientation was duly checked by compass, and the sheet containing the result is forwarded herewith.

The sunshine recorder is fixed to a wooden pedestal 6½ feet above the ground, and is in proper adjustment. On all sides the exposure is good, excepting a small farmhouse distant about 200 yards to the south-west, which might perhaps obstruct the sun's rays for a short time, though it

is very questionable. Mr. Spence, however, promised to keep a look out on the recorder when the sun sets in that direction.

Aberdeen, October 13th–15th.—As usual everything at this observatory was found in very good order.

The barograph and thermograph had their clocks, lenses, and fittings generally cleaned. The ratchet spring of the barograph clock required repairing, which I had done before re-starting the instruments.

The various thermometers were compared with the Kew standard No. 682, in melting ice, and their corrections at 32° found to be as follows :—

Dry, Standard 597 - - - - -	−0°·1
Wet, „ 395 - - - - -	−0·65
Maximum, 1002 - - - - -	+0·1
Minimum, 5056 - - - - -	0·0
Attached thermometer (to standard barometer), No. K.O., 71061 - - - - -	−0·2
Barograph thermometer (no number) - - -	−2·2

The external portions of the anemometer were dismounted, and all parts cleaned, and fresh oil applied to the bearings. The clock and recording apparatus were also attended to, and afterwards the orientation was examined and found satisfactory.

The Beckley gauge was cleaned generally, and the clock bearings oiled. As regards measuring the total rainfall collected by this gauge, it would be impracticable to do it with the instrument in its present position. If, however, it were shifted to the College ground there would be no difficulty, as arrangements could then be made to have a suitable chamber constructed on its new site.

North Shields, October 17th–18th.—The anemograph at this station was found to be in very good order all its bearings appearing to be well oiled and quite free. I, however, had the instrument partly dismounted, with the aid of Captain Harrison's assistant, and thoroughly cleaned all its parts, after which the bearings were lubricated by asbestoline. When re-mounted it was oriented, and the sheet containing the results accompanies this report.

(Signed) T. W. Baker.

Report of Visit to New Observatory at Westwood House, Cahirciveen, and other Stations, in March 1892.

I arrived on the evening of Saturday, March 5th.

On Monday Mr. Galvin came to the Observatory, accompanied by his workmen. We arranged for the closing in by a brick and slate erection of the instrument room on the ground floor, so that the thermograph should be on the ground level, and its thermometer bulbs should be fitted at a height of 5 feet above it. The mason accordingly prepared foundations for the erection of a wall arranged so as to form an alcove, which enclosed the thermograph slab and formed the north wall to the instrument room. Mr. Cullum and I then proceeded to Valencia, and dismounted the anemograph there, which we shipped on board a boat and conveyed direct to Westwood. The same evening we landed it and stowed it in the Westwood boathouse for the night.

The next morning we carted it up to the Observatory House, where we erected it upon the roof, making use of the same sheet-lead that we

had brought from Valencia, as we were unable to procure suitable new material at Cahirciveen. We then found some difficulty in joining up the shafts, for the new sections provided by Munro did not fit the old ones in any way. However, after some consideration and trouble I jointed up all the lengths by means of well-pinned mahogany plugs, excepting one joint which could not be made in that way, but which was carefully soldered up by Mr. Windeler, at the Telegraph Station, who kindly rendered me that service when I took the length to him. The next day we were able, after having cleaned the instrument thoroughly in every part and approximately oriented it, to set in action, having lost only three days' record during the transfer from the old Observatory.

On Thursday we went again to Valencia. We dismounted the thermograph and the standard thermometers, which we then conveyed to Westwood. The anemograph was properly oriented by means of the sun, and again started on Friday at 11 a.m. Then on Saturday we erected the thermograph slab, and properly covered in the instrument room. On Monday we fitted up the thermograph screen and cleaned the metal fittings, the lenses, and clock of thermograph. Tuesday, the 15th, the barograph and Stokes's sunshine recorder were dismounted at Valencia, and removed to the New Observatory, a proper brick pillar 5 feet high having been built to support the recorder in the meadow to the north of the house, but sufficiently distant as not to be shadowed at any time. On the 18th the barograph clock was cleaned, and the instrument was partly erected. The Beckley rain-gauge was planted over the site which had been prepared for it by excavating a hole and draining it, and fixing a levelled slate slab to support it.

On Saturday, March 19th, all the instruments were started provisionally, and on Monday, 21st, observations were made to adjust the sunshine recorder and to fix it in its place. The next day we dismounted and brought the standard barometer to Westwood, where we fixed it properly and adjusted it the next day, having referred its position to a bench-mark we had discovered on the wall of a cottage about half a mile distant to the south-east.

On March 24th I compared the thermometers with the Kew Standard No. 399, and found readings as follows:—

—	—	Correction.
Kew Standard - -	43·6	—
Dry „ - -	44·0	−0·4
Wet „ - -	43·8	−0·2
Maximum, No. 1003 -	43·6	0·0
Minimum, No. 2497 -	43·6	0·0

I then left Westwood, all instruments working well excepting the light stop in the case of the barograph.

On March 26th I visited the *Mountjoy Observatory*, where I dismounted and cleaned the anemometer and freshly oiled the bearings and clock.

March 29th and 30th I visited the *Armagh Observatory*, where the anemograph was not working. With the assistance of two workmen I was able to take down the instrument, and having built a fire round it and well heated the congealed oil, we were able to thoroughly clean it and afterwards to put it together and start it afresh, well oiled and

cleaned, leaving the bearings in perfect order. I also examined and oiled the Beckley rain-gauge, which I found to be in most excellent order.

I examined the anemograph at *Holyhead*, and found it in good order, with the exception of the arms and stays supporting the cups. These are very much corroded, due to the action of both smoke and spray, and will soon require to be replaced by new ones. The direction-fans are also considerably worn, but will last for some years longer. The new attendant in charge of the anemograph appears an active and intelligent young man. His name is William Davies.

(Signed) G. M. WHIPPLE.

APPENDIX VIII.

METHOD of DEALING with TELEGRAPHIC WEATHER INTELLIGENCE.

THE operations connected with the preparation and issue of the Forecasts and Storm Warnings have not undergone any material change.

Full details will be found in Appendix IX. to last year's Report.

DAILY WEATHER REPORT.

An important change has been made during the past year in the Daily Weather Report, a detailed description of which is given in the Annual Report for 1887. This alteration consists in the addition of a column giving the principal changes which have occurred in the weather at each station since the hour of observation on the previous day. The monthly averages of pressure, temperature, and rainfall hitherto printed for the current month on the second page of the Report have been published in a collective form as a preface to the volume for the second half of 1891. The Report still fills four large quarto pages.

The standing portions (maps, &c.) are printed in blue, while the information for each day is in black.

The subscription for the Report is —

For delivery by hand, where feasible, £2 per annum;
Do. by book post £1 „

MS. copies of the observations and remarks can be supplied at the rate of 2*l.* 10*s.* per annum. Arrangements can also be made for the supply of charts drawn from the 8h. a.m. or 6h. p.m. observations, such as appear in the "Times."

The Office receives, when the telegraphic communications are perfect, fifty-eight reports each morning, seventeen each afternoon (except on Sundays), and twenty-nine each evening, the arrangement of which is explained in the Annual Reports for recent years.

The Monthly "Correction and Addition List" is still published.

WEEKLY WEATHER REPORT.

The Weekly Weather Report, which has appeared since February 1878, was rearranged at the commencement of 1890, and is now prepared for the calendar week, Sunday to Saturday, thus bringing it into

agreement with other weekly publications. It is published regularly on Thursdays and is illustrated by three maps for each day. These, like the Daily Reports, show the outline of the land and sea in blue, while the information on them is in black. The maps show (1) for 8 a.m., the temperature, weather, and sea disturbance: and (2) for 8 a.m. and 6 p.m., the distribution of pressure and the winds, over, and on the coasts of, Europe. The information on the first and second pages of each report has been added to, and consists of observations of Temperature and Rainfall made at 76 stations, the individual values for which are now given on the second page of the Report, and of Sunshine records taken at 47 stations.

Tables of Accumulated Temperature designed to give persons engaged in agriculture better means of estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer, are given on the first and second pages, and show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively, of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard, or *base temperature*. The base value adopted is 42° Fahr.

Accumulated Temperature is expressed in Day-degrees; a Day-degree signifying 1° F. of excess or defect of temperature above or below 42° F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours. An explanation of the rules by which it is obtained will be found in the Annual Report for 1889, while full details as to the facts on which the rules are founded are published in Appendix II. to the Quarterly Weather Report for 1878.

In addition to the reports from the Telegraphic Reporting Stations, and the returns from the self-recording Observatories, weekly schedules from 56 volunteer observers are used, the names of the stations and observers being given below:—

The MS. of the report is prepared on Tuesday in every week, and the summary on its first page is sent to several papers on Tuesday evening; the printed copies of the complete report are ready for sale on Thursday afternoon.

1. Observers furnishing Temperature, Rainfall, and in some cases Bright Sunshine Records.

Names of Stations.	Names of Authorities.
Alnwick Castle	Lieut.-Col. F. Holland, for the Duke of Northumberland, K.G.
Arlington (N. Devon)	W. Stewart, for Lady Chichester.
Bawtry (Hesley Hall)	B. I. Whitaker, J.P., F.R. Met. Soc.
Blackpool	J. Wolstenholme.
Braemar	J. A. Aitken, J.P.
Brookeborough	Mr. Ferguson, for Sir Victor Brooke, Bt., F.L.S.
Cheadle	J. C. Philips.
Churchstoke	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester	The Royal Agricultural College.
Cullompton	T. Turner, J.P., F.R. Met. Soc.
Douglas (Isle of Man)	A. W. Moore, M.A., J.P.
Dublin	J. W. Moore, M.D., F.R. Met. Soc.
Durham Observatory	H. J. Carpenter.
Edgeworthstown (Currygrane)	J. M. Wilson, J.P.

Names of Stations.		Names of Authorities.
Fort Augustus	𝔖	Rev. A. Weld-Blundell, O.S.B.
Fort William	-	R. T. Omond, F.R.S.E., for Directors of Ben Nevis Observatory.
Foynes	-	W. Ward, for Lord Monteagle, K.P.
Geldeston	-	E. T. Dowson, F.R. Met. Soc.
Glencarron	𝔖	D. D. Munro, for Lord McLaren.
Glenlee	𝔖	W. Melville, for G. Maxwell.
Hastings (St. Leonard's)	-	H. Colborne, M.R.C.S.
Hereford	𝔐	T. A. Chapman, M.D.
Hillington	𝔐	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Kilkenny	-	H. Carlton, for the Marquis of Ormonde, K.P.
Killarney	-	The Ven. Archdeacon Wynne, F.R. Met. Soc.
Lairg	𝔖	J. Young, Schoolmaster.
Laudale (Loch Sunart)	-	A. Fletcher, for T. H. G. Newton, M.A., F.R. Met. Soc.
Llandovery	-	J. Watkins, F.R. Met. Soc.
Llandudno	𝔐	J. Nicol, M.D., F.R. Met. Soc.
Londonderry	-	J. Conroy, F.R. Met. Soc.
Marchmont	𝔖	P. Loney, for Sir Hugh P. Campbell, Bart.
Markree Castle (Co. Sligo)	-	A. Marth, F.R.A.S., for Colonel Cooper, F.R.A.S.
Newton Reigny (Penrith)	-	T. G. Benn, F.R. Met. Soc.
Ochtertyre	𝔖	G. Croucher, for Sir P. Keith Murray, Bart.
Plymouth	-	H. N. Dickson.
Prestwich (Manchester)	-	T. R. H. Clunn, M.D., F.R. Met. Soc.
Rothamsted	-	Rainfall by Sir J. B. Lawes, Bart., LL.D., F.R.S., and J. H. Gilbert, Ph.D., F.R.S.; temperature by T. Wilson, F.R. Met. Soc.
Scarborough	𝔐	W. Robinson.
Southampton	-	J. T. Cook, R.E., Ordnance Survey Office.
Stamford (Ketton Hall)	-	Fred. Coventry.
Stowell	𝔐	Rev. H. J. Poole, F.R. Met. Soc.
Strathfield Turgiss	𝔐	Rev. C. H. Griffith.
Waterford (Brook Lodge)	-	C. Percival Bolton, J.P.

The returns marked "𝔐" are supplied through the Royal Meteorological Society, those marked "𝔖" through the Scottish Meteorological Society.

2. Observers who furnish Records of Sunshine only.

Names of Stations.	Authorities.
Edinburgh	R. C. Mossman, F.R. Met. Soc.
Oswaldkirk	R. Thompson.
Worksop	H. Mellish, J.P., F.R. Met. Soc.
Thurcaston	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Margate	J. Stokes, F.R. Met. Soc.
*Brighton	A. Newsholme, M.D., F.R. Met. Soc.
Eastbourne	R. Sheward, F.R. Met. Soc.
*Westbourne	Rev. L. B. Birkett.
*Torquay	A. Chandler, F.R. Met. Soc.
*Guernsey	F. E. Carey, M.D., F.R. Met. Soc.
Newquay	J. Pearce.
*Tenby	J. E. Gower.
Arley Cottage (Co. Cavan)	Major Somerset A. Maxwell, F.R.A.S.

* Those marked with an asterisk use Jordan's (Photographic) Recorder; the others use the Stokes-Campbell (Burning) Recorder.

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* ckoned as Sundays.

of the public. Copies, or extracts from them, are communicated under the conditions stated below, but no information which is not substantially included in them can be supplied.

A series of boards is exhibited on the front of the Office showing in large type the state of the wind, weather, and sea disturbance at six stations, situated on our S.E., S., and W. coasts. The stations selected are Yarmouth, Dungeness, The Needles, Scilly, Holyhead, and Valencia Island, and the observations posted up are those for 8 a.m. and 2 p.m. daily, except on Sundays,* the boards being changed at about 9.45h. a.m. and 3h. p.m. The information can be easily read from the street.

FORECASTS FOR SUBSCRIBERS.—Any person can be supplied with a copy of the 11 a.m. Forecasts, once on each week day,* on payment of a subscription of ten shillings per annum, or 2*s.* 6*d.* per official quarter, *or any part thereof, in addition to the cost of transmission ;* the charges will therefore be, by *letter* post, 9*s.*, by *book* post, 5*s.* 9*d.*, per quarter.

The forecasts for any of the districts and for any of the hours mentioned on p. 10 can be forwarded by telegraph daily, on payment of 3*d.* per day for any definite period, in addition to the cost of telegraphy.

FORECASTS FOR CLUBS.—These are drawn up at 11 a.m., for all the districts, and are supplied to Clubs, for a subscription of ten shillings per annum. They are delivered free, by hand, to Clubs situated in or near Pall Mall. Special arrangements can be made for delivery at a greater distance by hand or by post.

FORECASTS FOR HAY AND CORN HARVESTS, OR FOR PUBLIC USE.—Special facilities are offered for the transmission of Forecasts for these purposes, a nominal fee of 2*s.* 6*d.* being charged for a quarter or any part thereof, in addition to the cost of the telegrams.

EXHIBITION OF TELEGRAPHIC FORECASTS AT LOCAL POST OFFICES.—The Post Office has sanctioned the exhibition of Forecasts at Local Post Offices, provided space is available, if the persons to whom they are addressed desire them to be so exhibited instead of being delivered.

Unless otherwise arranged, all forecasts transmitted by post are sent by book post, not as letters.

INQUIRIES as to the WEATHER.

INQUIRIES PERSONALLY OR BY MESSENGER.—Any person applying at the Meteorological Office between 11 a.m. and 8 p.m. on week days, and between 7 p.m. and 8 p.m. on Sundays,* can be supplied, in writing, with the latest information in the possession of the Office and with the latest forecast issued for any specified district, on payment of one shilling for each inquiry.

INQUIRIES BY LETTER.—Application may be made by letter, enclosing thirteen pence in stamps if the reply is to be *by post*, and one shilling in stamps, in addition to the cost of the reply (consisting of ten words, exclusive of the address) if the reply is to be *by telegraph*.

INQUIRIES BY TELEGRAPH.—Any person may obtain *by telegraph* from the Meteorological Office the latest information as to the weather

* Good Friday and Christmas Day are reckoned as Sundays.

in any district of the United Kingdom by payment of a fee of 1*s.* in addition to the cost of a telegram and reply to any post office. The telegram containing the inquiry must be addressed as follows:

To

WEATHER,

LONDON.

The payment for the reply should be for at least ten words in addition to the address.

Application may also be made for similar information to be sent either *by telegraph* or *post* on some future specified day.

CHECKING of FORECASTS and STORM WARNINGS.

The forecasts and storm warnings issued by the Office are carefully checked by being compared with the conditions actually experienced after their issue. The method adopted was fully explained in the Annual Report for last year.

In order to render the information in the possession of the Office as to the weather experienced on our coasts still more complete, the Council have, as in preceding years, made application to the various Light-house Boards, and have obtained from them the original log-books from some of the most exposed lightships and lighthouses. They would here express their cordial thanks for the co-operation so readily granted to them by these Boards.

The results of the checkings for 1891 will be found on pages 11, 13, and 14.

APPENDIX IX.

REPORT ON THE COMPARISON OF THE FORECASTS ISSUED AT 8h. 30m. p.m. WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1891 to March 1892. The results are for the United Kingdom as a whole.

The letters used have the following signification:—

a = complete success.	**c** = partial failure.
b = partial (more than half) success.	**d** = total failure.

The checking has been conducted on the same system as that employed in previous years, *i.e.*, each forecast has been considered under the separate headings of "Wind" and "Weather," but the results of the 8.30 p.m. Forecasts only are here published.

The first column gives the per-centage of success in "Wind," the second in "Weather," and the third the average of the two.

The Summary for the various districts is given on page 11.

Months.		Per-centages.				Months.		Per-centages.			
		Wind.	Weather.	Average.	a + b.			Wind.	Weather.	Average.	a + b.
April	a	48	62	55	81	October	a	37	57	47	81
	b	28	24	26			b	38	29	34	
	c	15	6	11			c	18	9	13	
	d	9	8	8			d	7	5	6	
May	a	44	56	50	81	November	a	36	52	44	74
	b	34	28	31			b	30	30	30	
	c	13	8	11			c	21	14	18	
	d	9	8	8			d	13	4	8	
June	a	52	59	56	81	December	a	48	65	57	83
	b	28	22	25			b	30	22	26	
	c	15	10	12			c	18	7	12	
	d	5	9	7			d	4	6	5	
July	a	57	58	58	87	January	a	44	57	51	77
	b	28	31	29			b	27	26	26	
	c	12	8	10			c	19	11	15	
	d	3	3	3			d	10	6	8	
August	a	33	55	44	83	February	a	42	53	48	78
	b	44	34	39			b	33	28	30	
	c	16	8	12			c	18	10	14	
	d	7	3	5			d	7	9	8	
September	a	40	44	42	79	March	a	46	55	51	81
	b	37	37	37			b	32	29	30	
	c	16	11	14			c	15	8	12	
	d	7	8	7			d	7	8	7	

		Per-centage.			
		Wind.	Weather.	Average.	a + b.
The entire year	a	44	56	50	80
	b	33	28	30	
	c	16	9	13	
	d	7	7	7	

APPENDIX X.

Telegraphic Weather Intelligence.

The following stations are supplied with telegraphic information of storms, free of expense, and signal "cones" have been furnished to

most of them, all further expenses attendant on the maintenance and repair of the apparatus being borne locally. The stations are situated, 97 in England and Wales, 47 in Scotland, 20 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.E.	IRELAND, S.W.	ENGLAND, S.W.	ENGLAND, E.
Lerwick.	New Ross.	St. Just.	Harwich.
Scalloway.	Dunmore East.	St. Sennen.	Ipswich.
Dunrossness.	Dungarvan.	Penzance.	Southwold.
Stromness.	Youghal.	Scilly.	Yarmouth.
Kirkwall.	Queenstown.	The Lizard.	Cromer.
Holborn Head.	Passage.	Falmouth.	Sheringham.
Dunnet Head.	Cork.	Pendennis.	Lynn.
Wick.	Kinsale.	Mevagissey.	Sutton Bridge.
Avoch.	Do. (Old Head)	Plymouth.	
Inverness.	Brow Head.	Devonport.	
Nairn.	Tralee.	Prawle Point.	
Burghead.	Limerick.	Teignmouth.	
Lossiemouth.	Galway.	Exmouth.	
Buckie.			
Port Knockie.	IRELAND, N.W.		
Cullen.			
Portsoy.	Malin Head.		
Banff.	Portrush.		
Fraserburgh.	Port Ballintrae.	ENGLAND, S.	
Peterhead.			ENGLAND, N.E.
Aberdeen.	IRISH SEA.	Guernsey.	
	Belfast.	St. Helier's (Jersey).	Boston.
	Donaghadee.	Gorey (Jersey).	Cleethorpes.
	Howth.	Weymouth.	Grimsby.
	Kingstown.	Poole.	Goole.
SCOTLAND, E.	Ramsey (I. of M.).	Cowes.	Hull.
	Douglas "	Ryde.	BridlingtonQuay.
Stonehaven.	Castletown "	St. Catherine's Point.	Filey.
Montrose.	Silloth.	Portsmouth.	Whitby.
Broughty Ferry.	Maryport.	Southampton.	Redcar.
Dundee.	Workington.	Littlehampton.	Middlesborough.
St. Andrews.	Whitehaven.	Brighton.	West Hartlepool.
Anstruther.	Barrow.	Newhaven.	Sunderland.
Pittenweem.	Morecambe.		South Shields.
Burntisland.	Fleetwood.		Tynemouth.
Grangemouth.	Blackpool.		Berwick - on - Tweed.
Bo'ness.	Lytham.		
Granton.	Preston.		
Newhaven.	Southport.	ENGLAND, S.E.	
Leith.	Liverpool.		
Fisherrow.	Runcorn.	Hastings.	
Dunbar.	Connah's Quay.	Rye.	
Cockburnspath.	Penmaenmawr.	Sandgate.	
St. Abb's Head.	Port Penrhyn.	Folkestone.	
Eyemouth.	Port Dinorwic.	Dover.	
	Carnarvon.	Ramsgate.	
	Holyhead.	Margate.	
		Faversham.	
	ST. GEORGE'S CHANNEL.	Sheerness.	
		Chatham.	
	Aberystwith.		
	Milford.		

[*continued.*]

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.W.	BRISTOL CHANNEL.		
Stornoway.	Pembrey.		
Port of Ness (Island of Lewis).	Llanelly.		
	Swansea.		
	Briton Ferry.		
	Portheawl.		
	Penarth.		
	Cardiff.		
	Do. Barry Dock.		
SCOTLAND, W.	Newport.		
	Weston-super-Mare.		
Glasgow.	Burnham.		
Greenock.	Bridgewater.		
Rothesay.	Ilfracombe.		
Campbelton.	Barnstaple.		
Girvan.	Appledore.		
Ballantrae.	Boscastle.		
	Port Isaac.		
	Newquay.		
	Hayle.		
	St. Ives.		

APPENDIX XI.

Fishery Barometers.

List of Places supplied with Fishery Barometers.

Shetland Isles.—Balta Sound, Uya Sound, Nesting, Lerwick, Sandsair, Scalloway, Symbister.

Orkney Isles.—Westray, Papa, Burra, Kirkwall.

Scotland, east coast.—Duncansbay, Freswick, Auchengill, Keiss, Staxigoe, Wick, Lybster, Dunbeath, Portmahomack, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy, Whitehills, Gardenstown, Rosehearty, Pitullie, Fraserburgh, Inverallochy, Pointlaw, Findon, Portlethen, Skateraw, Stonehaven, Arbroath, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance, Burntisland, Newhaven.

England, east coast.—Berwick, North Shields, South Shields, Sunderland, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn (2), Wells, Gorleston, Harwich, Brightlingsea, West Mersea, Woodbridge Haven, Margate, Deal, Kingsdown, Dover.

England, south coast.—Bognor, Ryde, Bembridge, Brixton, Atherfield, Ventnor (2), Gorey (Jersey), Haslar Hospital, Poole, Weymouth, Portland, Budleigh Salterton, Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscath, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn (2), Mousehole.

England, south-west coast.—St. Ives, Hayle, Port Isaac, Boscastle, Burnham, Highbridge, Weston-super-Mare.

Wales.—Briton Ferry, Swansea, Angle, Milford, Nevin, Carnarvon.

England, north-west coast.—Fleetwood, Morecambe, Maryport.

Isle of Man.—Douglas, Port St. Mary, Peel (2).

Scotland, south-west coast.—Port Patrick, Stranraer.

Ireland, east coast.—Cushendall, Belfast, Bangor, Groomsport, Donaghadee, Ardglass, Warren Point, Carlingford, Greenore, Dundalk, Malahide, Howth, Kingstown (2), Bray, Wicklow.

Ireland, south coast.—Dunmore East, Dungarvan, Crosshaven, Kinsale, Union Hall, Castletownsend, Baltimore, Schull (2), Crookhaven.

Ireland, west coast.—Valencia, Dingle, Tralee, Tarbert, Kilcredane, Kilronan, Spiddal, Elly Bay, Ballyglass, Ballycastle (Co. Mayo), Donegal, Tribane, Killybegs, Teelin, Portnoo, Burton Port, Kincaslagh, Bunbeg.

Ireland, north coast.—Dunfanaghy, Rathmullen, Buncrana, Moville, Greencastle, Portstewart, Portrush, Ballycastle (Co. Antrim).

Scotland, west coast.—Tarbert (Loch Fyne), Campbeltown, Carradale, Portree, Armadale (Isle of Skye), Plockton, East Mey, Stroma.

Hebrides.—Stornoway, Portnaguiran, Obb, Valtos, Carloway, Ness.

Summary of Stations supplied with Instruments.

England and Wales - - - - -	67
Scotland and Isle of Man - - - -	66
Ireland - - - - - -	52
	185

APPENDIX XII.

LIST of STATIONS from which CONTINUOUS RECORDS of BRIGHT SUNSHINE have been received

Station.	Observer.
Aberdeen Observatory	Prof. C. Niven, M.A., F.R.S.
Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S.
Blackpool	J. Wolstenholme.
Cambridge	H. Todd.
Churchstoke	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester	Prof. Ohm, B.A., F.R. Met. Soc.
Cronkbourne, Isle of Man	A. W. Moore, M.A., J.P.
Cullompton	Thos. Turner, J.P., F.R. Met. Soc.
Deerness (Orkney)	M. Spence.
Dublin, Mountjoy Observatory	Col. Kirkwood, R.E.
Durham	H. J. Carpenter, F.R.A.S.
Eastbourne	R. Sheward, F.R. Met. Soc.
Edinburgh	R. C. Mossman, F.R. Met. Soc.
Falmouth Observatory	E. Kitto, F.R. Met. Soc.; for the R. Cornwall Polytechnic Soc.
Fort Augustus	Rev. A. Weld-Blundell, O.S.B.
Fort William	R. T. Omond, F.R.S.E.; for the Directors Ben Nevis Observatory.
Geldeston, Beccles	E. T. Dowson, F.R. Met. Soc.
Glasgow	Prof. R. Grant, M.A., LL.D., F.R.S.
Harpenden	J. H. Gilbert, Ph.D., F.R.S.
Hastings	H. Colborne, M.R.C.S.
Hillington	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Jersey (St. Helier's)	Capt. Bichard, Harbour Master.
Kew Observatory	G. M. Whipple, B.Sc., F.R.A.S.; for the Kew Committee.
Leicester (Thurcaston)	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Llandudno	J. Nicol, M.D., J.P., F.R. Met. Soc.
London, Bunhill Row	Messrs. de la Rue.
„ Westminster	The Staff, Meteorological Office.
Marchmont	P. Loney; for Sir Hugh P. Campbell, Bt.
Margate	J. Stokes, F.R. Met. Soc.
Markree Castle	A. Marth, F.R.A.S.; for Col. E. H. Cooper, F.R.A.S.
Newquay	J. Pearce.
Newton Reigny (Penrith)	T. G. Benn, F.R. Met. Soc.
Oswaldkirk, Yorkshire	R. Thompson.
Oxford	E. J. Stone, M.A., F.R.S.
Parsonstown	O. Boeddicker, Ph.D.; for the Earl of Rosse, K.P., F.R.S.
Plymouth	H. N. Dickson, F.R. Met. Soc.
St. Ann's Head	S. Blake, Principal Lightkeeper.
Southampton	Sir C. Wilson, Col. R.E., K.C.B., F.R.S.
Stonyhurst	Rev. W. Sidgreaves, S.J.
Stornoway	John Forbes.
Sutton Coldfield	C. F. Marston, C.E.
Valencia	J. E. Cullum, F.R. Met. Soc.
Worksop	H. Mellish, F.R. Met. Soc.
York	J. B. Clarke, B.A., B.Sc.
Georgetown, British Guiana	G. S. Jenman.

In addition, the number of hours sunshine recorded each day is reported from the following Stations :—

Arley Cottage (Co. Cavan)	Major Somerset H. Maxwell, F.R.A.S.
Braemar	James Aitken, J.P.
Brighton	A. Newsholme, M.D., F.R. Met. Soc.
Guernsey	F. E. Carey, M.D., F.R. Met. Soc.
Tenby	J. E. Gower.
Torquay	Alfred Chandler, F.R., Met. Soc.
Westbourne	Rev. L. B. Birkett.

APPENDIX XIII.

Methods followed in dealing with Meteorological Returns from Land Stations in the British Isles.

These stations are of five classes, as stated on page 15.

I.—*Observatories continuously observing all the Meteorological Elements.*

Returns from observatories.

Hourly measurements of the curves obtained from the self-recording instruments at the observatories of the Office are made by the observers at each station, on printed forms supplied for the purpose, which, together with the curves, are forwarded to the Office weekly. They comprise measurements of the barograms, of the dry bulb and wet-bulb thermograms, of the anemograms, and of the rain-gauge curves.

Examination of returns.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the revised regulations which have been adopted to secure this end will be found in the Report of the Office for 1890. They comprise rules for the guidance of observers, as well as of the assistants charged with the examination of the work at the Office. Attention need be called here to only two of these rules, viz., (*a*) the use of subsidiary sheets on which are entered the results of a second set of measurements of the curves made after, and quite independently of, the first set, and with a different form of scale, the two sets of measurements being afterwards compared together, and any differences found inquired into and set right; and (*b*) the re-measurements of the curve made by the assistants at the Meteorological Office, and which always amount to 40, and in doubtful cases to many more, per month, for each element. The attention of the observers is always drawn to such errors as may be detected, and to any failures in the continuity of the curves arising from failure of the light, stoppage of the clock, defective photography, faulty action of the wet bulb thermometer, &c.; a report containing the results of the examination of each Observatory being also submitted to the Council periodically. The curves and tabulations are eventually bound and stored in the Office.

Results of examination and report to Council.

General supervision of observatory work.

In connexion with this work should be mentioned the general watch which has to be kept over the working of the observatories and of the instruments, not only to secure uniformity amongst them and observance of rules, but also to guard against small changes which are liable to occur at certain times, especially with the thermographs, and which may affect the scale-values of the instrument or the datum lines used for the tabulation of the curves. About twice a year this work calls for special examination, entailing some considerable time and occasionally the engraving of new scales for measuring the curves.

Method of dealing with the Numerical Results from the Self-recording Observatories.

Interpolations.

In dealing with the tabulations the first step is to go over the sheets and fill up by interpolation, wherever possible, any gaps or breaks in the continuity of the record.

The records having been made as complete as possible, are then used for the calculation of daily and hourly mean values, for periods of five days, calendar months, and for the year; which, together with other data obtained from the same source, are published under the title of "Hourly Means of the Readings obtained from the Self-recording "Instruments at the Four Observatories under the Meteorological

"Council." The volume for 1888 has been issued during the year, and considerable progress has been made with the calculations for the year 1889.

II.—*Anemographic Stations at which the Wind is recorded continuously.*

The anemograms received from the stations enumerated on page 72 are regularly examined and tabulated in the Office, and the sheets bound up in volumes. Besides special inquiries on legal and other points that from time to time arise, and in which these documents are of high importance, the tabulations are also regularly used in the checking of the Storm Warnings issued by the Office.

III.—*Land Stations of the Second Order.*

Origin and progress of system.

Ever since the year 1866 returns of more or less completeness have been received from land stations in the United Kingdom. In that year there was only one station, but by 1871 the number had increased to 15, and five years later to 49, including 14 stations belonging to the Royal Meteorological Society, copies of the returns from which were sent to the Office under a special arrangement with the Society.

At the end of March 1892 the total number of stations was 103, including 17 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society.

It must, however, be observed that while this number is exclusive of the self-recording observatories and of the anemographic stations, it includes several others from which only very scanty information is received.

The stations are distributed as follows: 45 in England, 4 in Wales, 28 in Scotland, and 26 in Ireland.

The methods followed with regard to the examination and publishing of these returns have been fully detailed in previous reports, and need not now be repeated. The changes introduced into the volume for 1886 have been continued in those for 1887 and 1888. These refer to the barometer readings, which are now given at station-level instead of being reduced to the mean sea-level; and to the humidity, where the depression of wet-bulb is shown, the international forms A and B being modified accordingly.

The volume for 1888 contains returns from 64 stations.

Arrangements have been made under which it is hoped that the arrears of this publication will be rapidly reduced.

Reports from 11 of the Irish stations are regularly supplied to the Registrar-General for Ireland for his Weekly and Quarterly Returns.

New stations.

When an application for the adoption of a new station is received, a schedule is forwarded to the observer containing a series of questions as to the outfit of the station, the exposure of the instruments, and the influence likely to be exerted on their indications by surrounding objects, such as houses and trees. Only mercurial barometers are accepted, and only such as have been duly verified. All thermometers must have been tested at Kew. A plan of the station, showing the positions of the instruments with regard to neighbouring objects, is also required.

On the return of this schedule the answers are considered, and, where necessary, alterations are advised.

If, however, the existing arrangements are satisfactory, tables for reducing the barometer readings to 32° Fahrenheit at mean sea level are prepared and duplicates sent to the observer, together with a set of Hygrometrical Tables, and a copy of "Instructions in the Use of Meteorological Instruments."

The first returns are compared and examined with special care, and a report of the result of the examination is forwarded to the observer, with instructions how best to improve and complete the returns.

There are still many parts of the British Islands very poorly represented by the existing stations, and any information for these districts would be valuable.

Sunshine records.

The daily records of sunshine which are now received from 44 Stations in the British Islands are examined generally to guard against accidental changes in the adjustment of the instruments. Notes explaining any omission or accidental defect are added to the cards if required, and after their receipt has been acknowledged, they are duly stamped and dated and then stored in the Office.

Weekly totals.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VIII., and for those stations which are also Stations of the Second Order the monthly totals of bright sunshine in hours, together with the per-centages of its possible duration, are published as Part IV. of "Returns from Stations of the Second Order." A table showing the daily amount of sunshine at Bunhill Row, one of the London stations, is also prepared quarterly for the Royal Meteorological Society.

Inspection.

The Stations of the Second Order are regularly inspected, the attention of the inspector being directed by the Office to any special point which may require investigation.

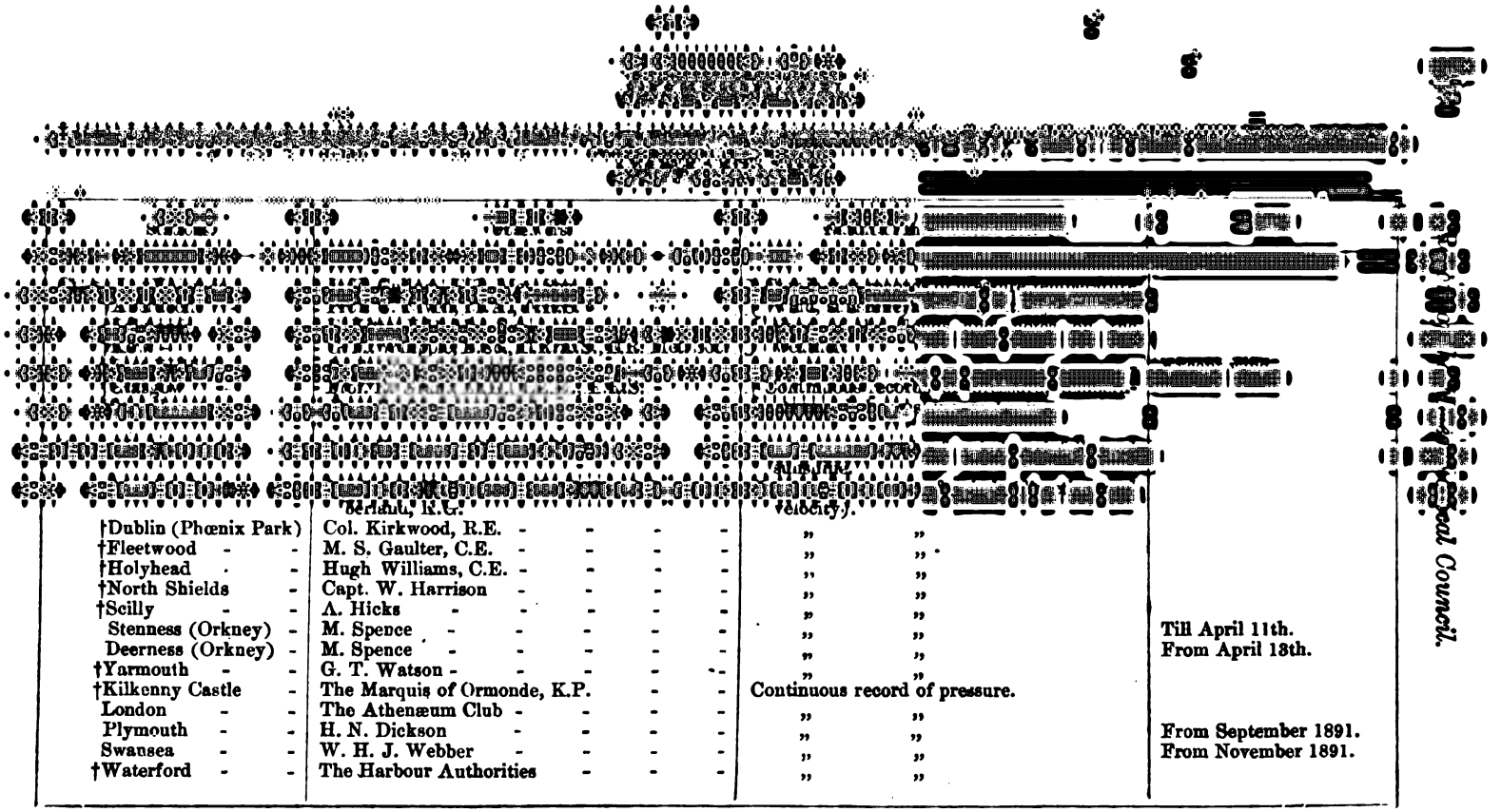
IV.—*Telegraphic Reporting Stations.*

Full particulars relating to these stations, the information received from them, and the method of dealing with that information, will be found in Appendix VII. to the Report for the year 1888–9. A paragraph in that Appendix (p. 60) explains the use that is made of the monthly schedules sent in by the observers.

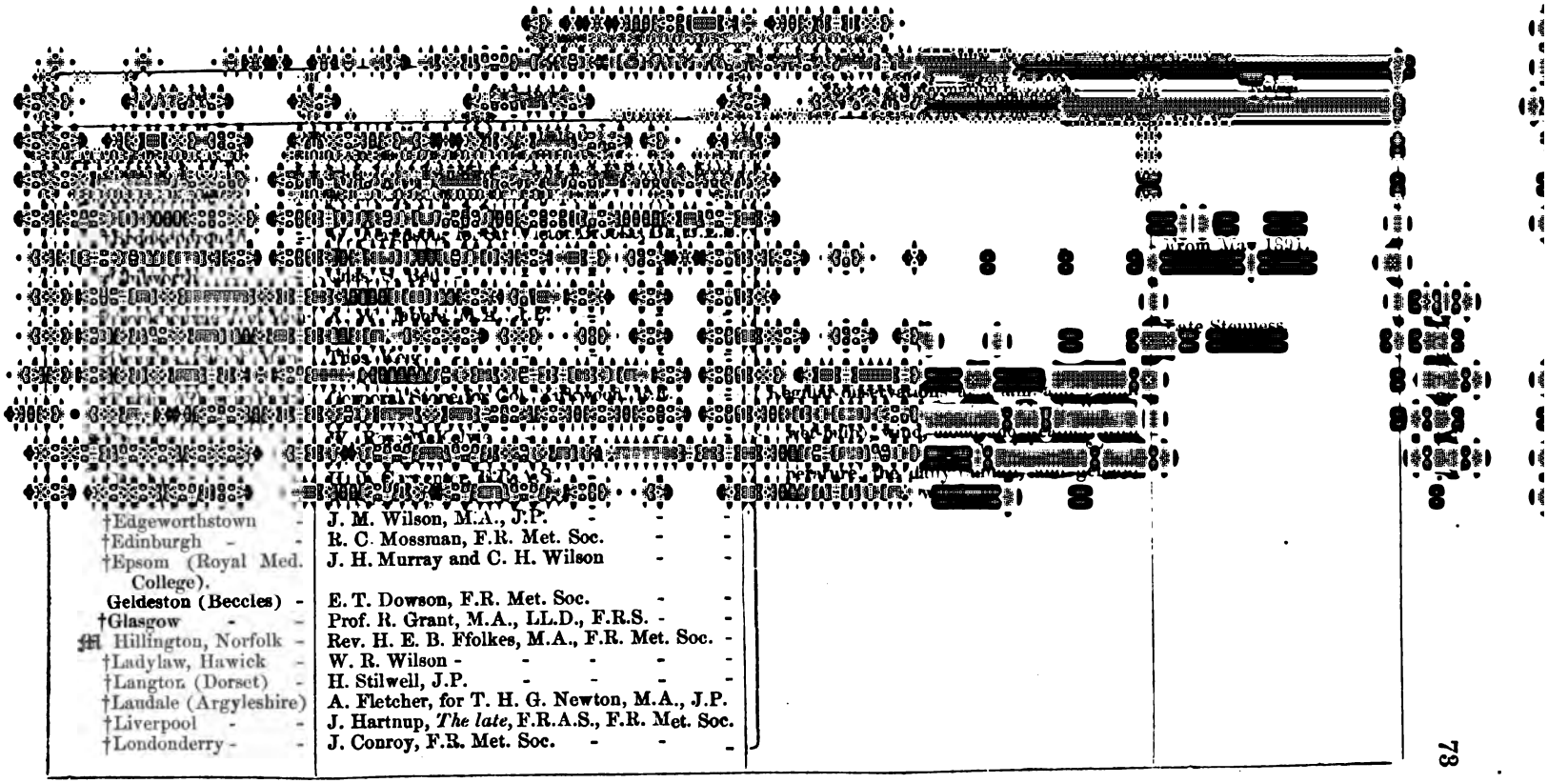
V.—*Extra Stations.*

No returns from Stations of the Fifth Class are published by the Office, but some of them are regularly used in the checking of the Storm Warnings, and all are available for any special investigation that may be taken up.

The rainfall values at these stations are, however, copied and supplied to Mr. Symons, F.R.S., for publication in "British Rainfall."

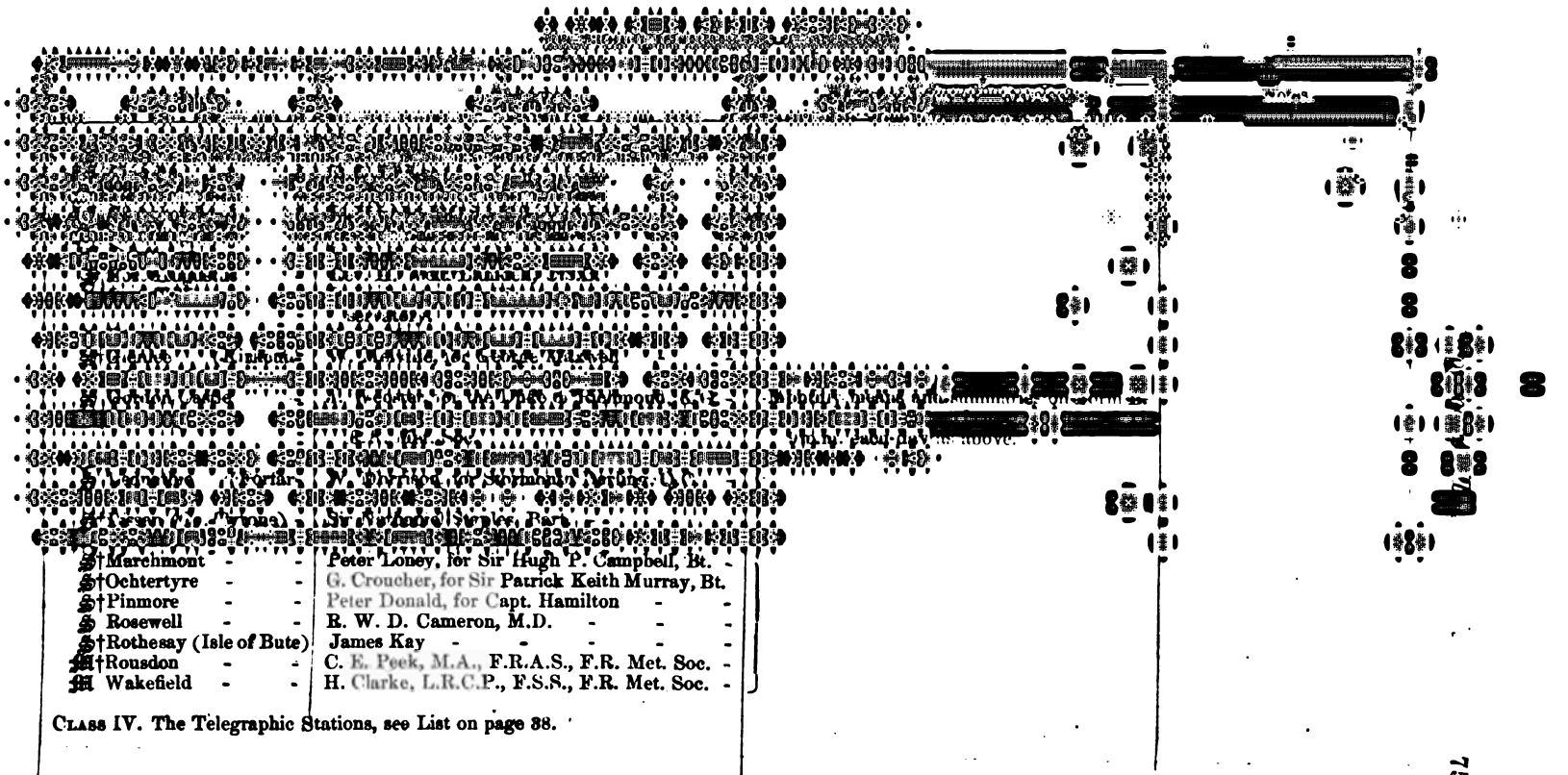


†Dublin (Phœnix Park)	Col. Kirkwood, R.E.	"	"	
†Fleetwood	M. S. Gaulter, C.E.	"	"	
†Holyhead	Hugh Williams, C.E.	"	"	
†North Shields	Capt. W. Harrison	"	"	
†Scilly	A. Hicks	"	"	
Stenness (Orkney)	M. Spence	"	"	Till April 11th.
Deerness (Orkney)	M. Spence	"	"	From April 13th.
†Yarmouth	G. T. Watson	"	"	
†Kilkenny Castle	The Marquis of Ormonde, K.P.	Continuous record of pressure.		
London	The Athenæum Club	"	"	
Plymouth	H. N. Dickson	"	"	From September 1891.
Swansea	W. H. J. Webber	"	"	From November 1891.
†Waterford	The Harbour Authorities	"	"	



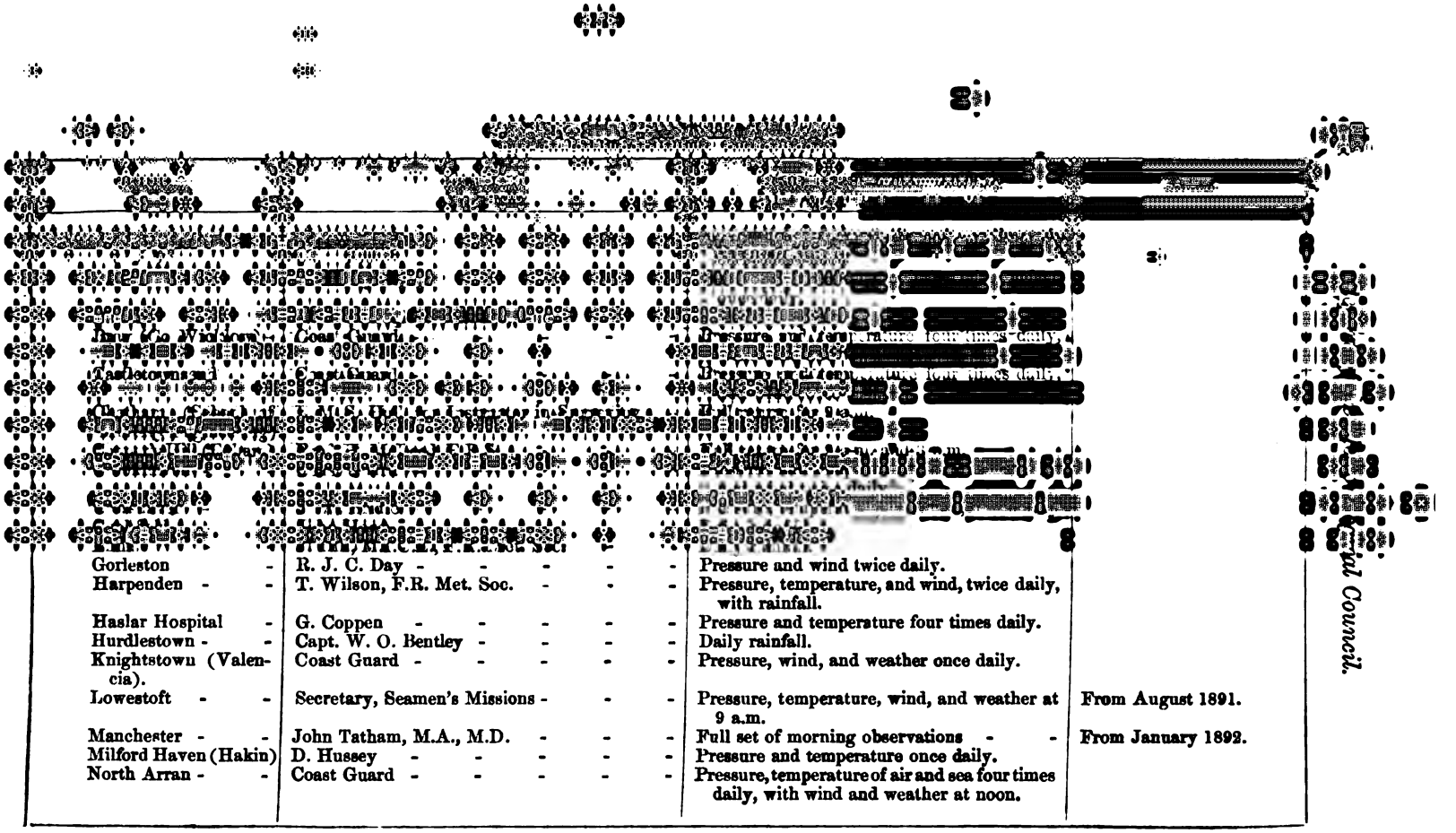
†Edgeworthstown -	J. M. Wilson, M.A., J.P. - - -
†Edinburgh - -	R. C. Mossman, F.R. Met. Soc. - -
†Epsom (Royal Med. College).	J. H. Murray and C. H. Wilson - -
Geldeston (Beccles) -	E. T. Dowson, F.R. Met. Soc. - -
†Glasgow - -	Prof. R. Grant, M.A., LL.D., F.R.S. - -
Hillington, Norfolk -	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc. -
†Ladylaw, Hawick -	W. R. Wilson - - - - -
†Langton (Dorset) -	H. Stilwell, J.P. - - - -
†Landale (Argyleshire)	A. Fletcher, for T. H. G. Newton, M.A., J.P.
†Liverpool - -	J. Hartnup, *The late*, F.R.A.S., F.R. Met. Soc.
†Londonderry - -	J. Conroy, F.R. Met. Soc. - - -

†Tealby (Lincolnshire)	Rev. S. Lewin		From July 1891.
Uppingham	Rev. G. H. Mullins, M.A., F.R. Met. Soc.		
☘†Wolfelee (Roxburghshire).	M. W. Cockburn, for Sir W. Elliott, K.S.I.		
†York	J. Wright, for Yorkshire Phil. Soc.		
Class IIIa.			
☘†Bennington, Herts	Rev. J. Dunne Parker, LL.D., F.R. Met. Soc.	Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m. each day as above.	
☘†Berkhamsted	E. Mawley, F.R.H.S., F.R. Met. Soc.		
☘ Buxton	E. J. Sykes, M.B., F.R.A.S., F.R. Met. Soc.		
☘†Callton Mor	J. Russell, for J. Malcolm of Poltalloch, M.P.		



⚓†Marchmont - -	Peter Loney, for Sir Hugh P. Campbell, Bt. -
⚓†Ochtertyre - -	G. Croucher, for Sir Patrick Keith Murray, Bt.
⚓†Pinmore - -	Peter Donald, for Capt. Hamilton - -
⚓ Rosewell - -	R. W. D. Cameron, M.D. - - -
⚓†Rothesay (Isle of Bute)	James Kay - - - -
⚓†Rousdon - -	C. E. Peek, M.A., F.R.A.S., F.R. Met. Soc. -
⚓ Wakefield - -	H. Clarke, L.R.C.P., F.S.S., F.R. Met. Soc. -

CLASS IV. The Telegraphic Stations, see List on page 38.



Gorleston -	R. J. C. Day - - - - -	Pressure and wind twice daily.	
Harpenden - -	T. Wilson, F.R. Met. Soc. - - -	Pressure, temperature, and wind, twice daily, with rainfall.	
Haslar Hospital -	G. Coppen - - - - -	Pressure and temperature four times daily.	
Hurdlestown - -	Capt. W. O. Bentley - - - -	Daily rainfall.	
Knightstown (Valencia).	Coast Guard - - - - -	Pressure, wind, and weather once daily.	
Lowestoft - -	Secretary, Seamen's Missions - - -	Pressure, temperature, wind, and weather at 9 a.m.	From August 1891.
Manchester - -	John Tatham, M.A., M.D. - - -	Full set of morning observations - -	From January 1892.
Milford Haven (Hakin)	D. Hussey - - - - -	Pressure and temperature once daily.	
North Arran - -	Coast Guard - - - - -	Pressure, temperature of air and sea four times daily, with wind and weather at noon.	

Council.

LIST OF DOCUMENTS—*continued.*

Stations.	Observers.	Nature of Information received.	Notes.
Rosehearty - -	Coast Guard - - - - -	Pressure once daily.	
†Rugby - -	W. N. Wilson, M.A., and H. P. Highton, B.A.	Full set of 9 a.m. observations with 9 p.m. temperatures.	
†St. Leonards - -	H. Colborne, M.R.C.S. - - -	Full set of 9 a.m. observations.	
Schull - -	Coast Guard - - - - -	Pressure, temperature, and wind twice daily.	
†Sheffield (Weston Park)	Elijah Howarth, F.R.A.S. - - -	Full return for 9 a.m. and 6 p.m.	
Spiddal - -	Coast Guard - - - - -	Pressure and temperature four times daily, with wind and weather at noon.	
†Stamford (Ketton Hall)	Fred. Coventry - - - -	Pressure, temperature (max., min., min. on grass), rainfall, and wind once daily.	
Stranraer -	P. Doran - - - - -	Pressure, wind, and weather once daily.	
†Sudbury - -	W. Bayley Ransom - - - -	Pressure, temperature (dry-bulb, max., min.), wind, cloud, and rainfall, once daily, with general remarks.	
Swineshead (Boston)	J. H. Brown - - - - -	Daily rainfall - - - - -	From January 1892.
Symbister, Shetland -	J. S. Nicolson - - - - -	Pressure and temperature twice daily.	
Tarbert, Harris -	Donald Bethune - - - -	Pressure and wind twice daily.	
Totland Bay - -	John Dover, B.A., F.R. Met. Soc. - -	Full return for 9 a.m.	
Union Hall (Glandore)	Coast Guard - - - - -	Pressure, temperature, and wind, twice daily.	
Westray (Orkney) -	Capt. J. Hewison - - - -	Pressure, temperature, and wind, twice daily.	

NOTES.—In addition to the above a daily record of observations made at the Royal Observatory, Greenwich, is kindly supplied by the Astronomer Royal. The Stations marked "℔" belong to the Royal Meteorological Society; those marked "℔" belong to the Scottish Meteorological Society those marked thus † have been inspected during the year.

APPENDIX XV.

Accessions to the Library during the Year ending 31st March 1892.

|| **(Abbe, C.)**—A relation between meteorology and the grasshopper or locust pest. Read before the Nat. Acad. Sc. 8°. (*Amer. Nat.*, 1880, *Oct.*, *p.* 735.)

——— On the selection of a prime meridian. 4°. [Printed for delivery before the Internat. Conf. on Oct. 13, 1884, but afterwards withdrawn.]

|| ——— The Signal Service bibliography of meteorology. la. 8°. Washington, 1887. (*Bull. Phil. Soc. Washington*, x.)

|| ——— William Babcock Hazen. la. 8°. (*Pop. Sc. Monthly*, xxxi., 1887, *May*, *p.* 112.)

|| [———] Sketch of James Pollard Espy. la. 8°. (*Pop. Sc. Monthly*, 1889, *April*, *p.* 834.)

|| ——— A plea for terrestrial physics. la. 8°. Salem, 1890. (*Proc. Amer. Assoc. Adv. Sc.*, xxxix., 1890, *p.* 65.)

|| ——— An account of progress in meteorology. 1879–81, 1882, 1883. 3 vols. la. 8°. Washington, 1883–84. (*Smithsonian Rep.*, 1881, 1882, 1883.)

|| ——— An account of recent progress in dynamic meteorology. la. 8°. Washington, 1890. (*Smithsonian Rep.*, 1888, *p.* 355.)

|| ——— Notice of localities in St. Helena that have special interest to scientists. la. 4°. (*St. Helena Guardian*, 1890, *April* 3.)

* **Abercromby, Hon. R.**—Signs in the sky. la. 8°. (*Good Words*, 1890, *Aug.*, *p.* 518.)

Adelaide Observatory.—Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the northern territory, during the year 1889, under the direction of **C. Todd.** sm. f°. Adelaide, 1891.

[——— ———] Rainfall in South Australia and the Northern Territory during 1890; with weather characteristics of each month. By **C. Todd.** f°. Adelaide, 1891.

|| **Aguilar Santillán, R.** — Bibliografía meteorológica Mexicana correspondiente al año de 1890. la. 8°. (*Mem. Soc. Alzate Mexico*, vi.)

Aitken, James.—Meteorological table for the year 1890. Compiled from observations taken at Braemar, Aberdeenshire. oblong la. 8°. s.l.e.a.

|| **Aitken, John.**—On ocean circulation. 8°. Edinburgh, 1874. (*Trans. R. Scott. Soc. Arts*, ix., 1873–74.)

|| ——— On ocean circulation. 8°. (*Proc. R. Soc. Edinb.*, ix., 1875–78, p. 394.)

|| ——— On the distribution of temperature under the ice in frozen lakes. 8°. (*Proc. R. Soc. Edinb.*, x., 1878–80, *p.* 409.)

|| ——— On dust, fog, and clouds. Read, Part i., Dec. 20, 1880; Part ii., Feb. 7, 1881. 4°. Edinburgh, 1882. (*Trans. R. Soc. Edinb.*, xxx., *Part I.*, *p.* 337.)

|| ——— On the effect of oil on a stormy sea. 8°. (*Proc. R. Soc. Edinb.*, xii., 1882–84, *p.* 56.)

|| ——— On the moon and the weather. 8°. (*Proc. R. Soc. Edinb.*, xii., 1882–84, *p.* 187.)

|| ——— On thermometer screens. Part iii. 8°. (*Proc. R. Soc. Edinb.*, xiii., 1884–86, *p.* 632.)

|| ——— On a monochromatic rainbow. 8°. (*Proc. R. Soc. Edinb.*, xv., 1887–1888, *p.* 135.)

|| ——— On the number of dust particles in the atmosphere of certain places in Great Britain and on the Continent, with remarks on the relation between the amount of dust and meteorological phenomena. 8°. (*Proc. R. Soc. Edinb.*, xvii., 1889–90, *p.* 193.)

|| ——— On a simple pocket dust-counter. 8°. (*Proc. R. Soc. Edinb.*, xviii., 1890–91, *p.* 39.)

Note.—Books marked * have been acquired by purchase; the others are donations from institutions, societies, or authors. Those marked || are excerpt papers, extra copies of which have been separately printed.

In some cases additional publications have been received besides those specified ut only completed volumes or years are given here.

|| **Aitken, John.**—On a method of observing and counting the number of water particles in a fog. 8°. (*Proc. R. Soc. Edinb.*, xviii., 1890–91, *p.* 259.)

|| ——— On the solid and liquid particles in clouds. 1a. 4°. Edinburgh, 1891. (*Trans. R. Soc. Edinb.*, xxxvi., *Part* ii., *p.* 313.)

American Meteorological Journal.—A monthly review of meteorology, medical climatology, and geography. Edited by **M. W. Harrington, A. L. Rotch,** and **W. J. Herdman.** Vol. VII., 1890–91. 1a. 8°. Ann Arbor, s.a.

[Algiers, Service Météorologique du Gouvernement Général de l'Algérie.]—Bulletin météorologique de l'Algérie. 1891, Jan. 1—Dec. 31, oblong sm. f°. Sheets.

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.—Tijdschrift . . . onder redactie van **C. M. Kan** en **J. Æ. C. A. Timmerman.** Tweede serie. Deel viii. 2 vols. 8°. Leiden, 1891.

|| **Anderson, J.**—Barographic record in the vicinity of a tornado. Read June 2, 1890. 8°. (*Proc. R. Soc. Edinb.*, xviii.)

* **Ansted, D. T., and Latham, R. G.**—The Channel Islands. With illustrations drawn by P. J. Naftel. 1a. 8°. London, 1862.

* **Antarctic Circle, The.**—(*Edinb. Rev.*, 1891, *April*, *No.* 354, *p.* 376.)

Assmann, R.—Aspiration apparatus invented by Dr. R. Assmann at Berlin, constructed by R. Fuess. 1a. 4°. s.l.e.a.

|| ——— Das Aspirations-psychrometer. Ein Apparat zur Bestimmung der wahren Temperatur und Feuchtigkeit der Luft. 1a. 4°. Berlin, 1892. (*Abhandl. k. Preuss. Meteor. Inst.*, I., *No.* 5.)

|| ——— Das Aspirations-psychrometer. 1a. 8°. (*Zeitschr. für Instrumentenk., Berlin*, xii, 1892, *p.* 1.)

|| [———] Gebrauchsanweisung für das Assmann'sche Aspirations-psychrometer, konstruirt von **R. Fuess.** 1a. 8°. (*Zeitschr. für Instrumentenk., Berlin*, 1892. *Heft* 1.)

Augustin, F.—Ueber die Schwankungen des Wasserstandes der Moldau. 1a. 8°. (*Sitzungsb. k. böhm. Gesellsch. Wissensch., Prague*, 1891, *p.* 50.)

Avignon, Commission Météorologique du Département de Vaucluse.—Compte-Rendu pour l'année 1890. sm. f°. s.l.e.a.

Azambuja, G. A. de.—Annuario do Estado do Rio Grande do Sul para o Anno de 1892. Anno viii. sm. 8°. Porto Alegre, 1891.

* **Ball, Sir R.**—The cause of an ice age. sm. 8°. London, 1891.

Ballou, S. M.—Papers from the Laboratory of Physical Geography of Harvard College. No. 5. Prof. Russell's theory of cold waves. 1a. 8°. (*Amer. Meteor. Journ.*, vii., 1891.)

Barral, F. A.—Noticia sobre o clima do Funchal e sua influencia no tratamento da tisica pulmonar. 4°. (*Mem. Acad. R. Sc. Lisboa.* 1ª *Cl.*, i., *Part* i., 1854.)

|| **Baxendell, J.**—Abstract of meteorological results for the Borough of Southport. Averages for the 19 years, 1872–90 inclusive. 18°. Slip. (*Southport Corporation Year Book for* 1891–92.)

——— Abstract of results of meteorological observations [at Southport] for the year 1891. 18°. Southport, 1892.

——— Abstracts of observations at the Southport meteorological observatory for the weeks ending Jan. 9, 1891-Jan. 1, 1892. Slips.

|| **Beaumont, H. B. de.**—Présentation, avec cartes nouvelles, d'une cartographie générale pour le meilleur enseignement de la géographie. 1a. 8°. (*Le Globe, Genève*, xxx., *p.* 213.)

Belize.—Summary of meteorological observations at St. Joseph's Observatory during the months of Jan.—Dec. 1891. 4°. Sheets. (*The Angelus, Belize*, 1891–92.)

|| **Berg, E.**—Über die Häufigkeit und geographische Vertheilung starker Regenfälle im Europaischen Russland. 1a. 4°. St. Petersburg, 1891. (*Repert. Meteor.*, xiv., *No.* 10.)

Berghaus' Physikalischer Atlas.—

Abteilung ii. Atlas der Hydrographie. See BERGHAUS, H.
„ iii. Atlas der Meteorologie. See HANN, J.
„ iv. Atlas der Erdmagnetismus. See NEUMAYER, G.
„ v. Atlas der Pflanzenverbreitung. See DRUDE, O.
„ vi. Atlas der Tierverbreitung. See MARSHALL, W.
„ vii. Atlas der Völkerkunde. See GERLAND, G.

* **Berghaus, H.**—Atlas der Hydrographie. (*Berghaus' Physikalischer Atlas Abteilung* ii.) f°. Gotha, 1891.

Bergholz, P.—Ergebnisse der meteorologischen Beobachtungen in Bremen. See BREMEN.

Berlin, Deutsche Meteorologische Gesellschaft.—Berliner Zweigverein der deutschen meteorologischen Gesellschaft. Neuntes Vereinsjahr, 1892. 8°. Berlin, 1892.

——— **Hydrographisches Amt des Reichs-Marine-Amts.**—Annalen der Hydrographie und maritimen Meteorologie. xix. Jahrg., 1891. la. 8°. Berlin, s.a.

——— **Königlich Preussisches meteorologisches Institut.**—Ergebnisse der meteorologischen Beobachtungen, 1888. la. 4°. Berlin, 1891.

|| ——— ——— Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1891, Jan.-Dec. la. 4°. (*Statist. Korresp.*)

|| **Bezold, W. v.**—La meteorologia moderna e la formazione delle precipitazioni. (Dal Himmel und Erde, annata ii., fasc. 1 e 2.) Traduzione e note del **M. Rajna.** la. 8°. Milano, 1891. (*Annuario Sezione Milan. Club Alp. Ital.*, 1891.)

Bibliothèque Universelle [et Revue Suisse]. Archives des sciences physiques et naturelles. Troisième période. Tomes xxv.-xxvi. 2 vols. 8°. Genève, 1891.

|| **Blanford, H. F.**—On the variations of the rainfall at Cherra Poonjee in the Khasi Hills, Assam. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvii., 1891, *p.* 146.)

* **Blizzard in the West** (The): being a record and story of the disastrous storm which raged throughout Devon and Cornwall, and West Somerset, on the night of March 9th, 1891. sm. 8°. London and Devonport, [1891].

(Bombay, Government Observatory.)—Report on the condition and proceedings of the Government Observatory, Colába, for the year which ended with the 30th June 1891. f°. s.l.e.a.

[——— **Meteorological Office.**]—Brief sketch of the meteorology of the Bombay Presidency in 1890-91. f°. s.l.e.a.

Bremen.—Ergebnisse der meteorologischen Beobachtungen in Bremen von 1803 bis 1890. Herausgegeben von **P. Bergholz.** Jahrg. i. la. 4°. Bremen, 1891.

British North Borneo Herald and Official Gazette. Vol. ix. 1891 Nos. 1-12. f°. Sandakan, 1891.
Contains meteorological observations.

Brodie, F. J.—Some remarkable features in the winter of 1890-91. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvii., 1891, *p.* 155.)

|| **Brückner, E.**—Das Klima der Eiszeit. 8°. (*Verhandl. 73 Jahresversamm lung der Schweiz. Naturf. Gesellsch. in Davos*, 1890.)

* ——— Klimaschwankungen seit 1700 nebst Bemerkungen über die Klimaschwankungen der Diluvialzeit. Geogr. Abhandl. herausgegeben von A. Penck in Wien. Bd. iv., Heft 2. la. 8°. Wien und Olmütz, 1890.

Brunton, T. L.—An address on the method of Zadig in medicine, delivered at the Inaugural Meeting of the North London Med. Chirurg. Soc., Dec. 17, 1891. 4°. (*The Lancet, Jan.* 2, 1892.)

Brussels, Observatoire Royal.—Bulletin météorologique. 1891, Jan. 1—Dec. 31. f°. Sheets.

|| **Buchan, A.**—On a difference between the diurnal barometric curves at Greenwich and at Kew. Read June 16, 1890. 8°. (*Proc. R. Soc. Edinb.*, xviii.)

|| ——— The influence of high winds on the barometer at the Ben Nevis Observatory. Read March 2, 1891. 8°. (*Proc. R. Soc. Edinb.*, xviii.)

Bucharest, Institutul Meteorologic al Romaniei.—Analele . . . de **S. C. Hepites.** Tom. iv., 1888. la. 4°. Bucuresti, 1891.
In the French language also.

Buenos Ayres, Oficina Meteorológica Argentina.—Anales. Tomo viii. la. 4°. Buenos Aires, 1890.

* **Buist, G.**—On the saltness of the Red sea. 8°. [*Trans. Bombay Geogr. Soc.*, ix., 1850, *p.* 38.]

Cairo, Ministère de l'Intérieur. Administration des Services Sanitaires et d'Hygiène Publique.—Rapport annuel. 1888, 1889. 2 vols. f°. Berlin (1890) and Le Caire, 1891.

——— ——— ——— Bulletin hebdomadaire. 6me année, 1891, Nos. 1–52. Suppl. au Journ. Officiel, 1891–92. la. 4°.

(Calcutta, Meteorological Office, Bengal.)—Administration report of the Meteorological Reporter to the Government of Bengal for the year 1890–91. sm. f°. s.l.e.a.

[——— ———] Bay of Bengal weather chart. 1891, Jan. 1—Dec. 31. sm. f°. Sheets.

——— ——— Bengal daily weather report. 1891. sm. f°. Sheets.
These reports are only published during the rainy season.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the weeks ending January 10, 1891, to January 2, 1892. f°.

——— ——— Meteorological and rainfall table of the Province of Bengal for the months of January to December 1891, with annual tables. sm. f°.

——— ——— Meteorological summary of the monsoon period of 1890 and 1891. 2 parts. sm. f°. s.l.e.a.

[——— ———] Summary of the meteorology of the year 1890. sm. f°. s.l.e.a.

Calcutta, Meteorological Office, India.—Abstract of the results of the barometric and thermometric observations taken at the Meteorological Office, Chowringhee. 1891, Jan.—Dec. sm. f°. Sheets.

——— ——— Abstract of the results of meteorological observations taken at the Alipore Observatory in the months of Jan.—Dec. 1891. sm. f°. Sheets.

——— ——— Cyclone memoirs. Part iv. Arabian Sea. An inquiry into the nature and course of storms in the Arabian Sea and a catalogue and brief history of all recorded cyclones in that Sea from 1648 to 1889. By **W. L. Dallas.** la. 8°. Calcutta, 1891.

[——— ———] India daily weather report. 1891, Jan. 1—Dec. 31. f°. Sheets.

[——— ———] Memorandum on the snowfall in the mountain districts bordering Northern India and the abnormal features of the weather in India during the past five months, with a forecast of the probable character of the south-west monsoon rains of 1891. f°. Simla, 1891.

——— ——— Report on the administration of the Meteorological Department of the Government of India in 1890–91. f°. s.l.e.a.

——— ——— Report on the meteorology of India in 1889. By **J. Eliot.** 15th year. f°. Calcutta, 1891.

——— ——— Results of the barometrical and thermometrical observations taken at the Meteorological Office, Chowringhee, from 4th January 1891 to 2nd January 1892. sm. f°. Sheets.

——— ——— Results of the meteorological observations taken at the Alipore Observatory, from 4th January 1891 to 2nd January 1892. sm. f°. Sheets.

Calcutta, St. Xavier's College Observatory.—[Meteorological observations.] Jan. 1868 to Dec. 1885. la. f°. Sheets. Calcutta, s.a.

Cambridge (Mass.), Astronomical Observatory of Harvard College.—Annals. Vol. xix., Part i. Meteorological observations made during the years 1840 to 1888 inclusive, under the direction of . . . successive Directors of the Observatory. la. 4°. Cambridge, 1889.

——— ——— Annals. Vol. xxx. Parts i. and ii. Observations made at the Blue Hill meteorological observatory, Mass., U.S.A., in the years 1889, 1890. Under the direction of **A. L. Rotch.** la. 4°. Cambridge, 1890–91.

——— **New England Meteorological Society.**—Bulletin, 1891. Jan.—Dec. 4°. s.l.e.a.

Cape Town, Meteorological Commission, Cape of Good Hope.—Report. 1890. sm. f°. Cape Town, 1891.

Carlsruhe, Centralbureau für Meteorologie und Hydrographie.—Deutsches meteorologisches Jahrbuch für 1890. Grossherzogthum Baden. Die Ergebnisse der meteorologischen Beobachtungen im Jahre 1890 nebst den Mittelwerthen und Extremen für den fünfjährigen Zeitraum, 1886-1890. Bearbeitet von **C. Schultheiss.** la. 4°. Karlsruhe, 1891.

——— ——— Uebersicht der Ergebnisse der an den badischen meteorologischen Stationen angestellten Beobachtungen, nebst Wasserstandsaufzeichnungen an den wichtigsten Hauptpegeln des Rheins. 1891, Jan.—Dec. f°. Sheets.

Chandler, A.—Sunshine and rainfall of August 1891. Read at the Torquay Nat. Hist. Soc., 1891. Newspaper cutting.

Chemnitz, K. Sächsisches meteorologisches Institut. — Deutsches meteorologisches Jahrbuch für 1889, 1890. Beobachtungs-System des Königreiches Sachsen. 2 vols. la. 4°. Chemnitz, 1890-91.

——— ——— Wetterbericht. 1887-90. oblong la. 8°.

[——— ———] Wetterbericht. 1891, Mch.-Dec. la. 4°. (*Wissensch. Beil. der Leipziger Zeitung*, 1891-92.)

Christiania, Norwegisches meteorologisches Institut.—Jahrbuch. 1889. sm. f°. Christiania, 1891.

Christopher, J. S.—The new map of the world. On the projection of J. S. Christopher. Scientifically, practically, and intelligibly correct, without any antipodes. la. f°. Sheet.

* **Ciel et Terre.**—Revue populaire d'astronomie, de météorologie, et de physique du globe. xii^e^ année; 1891-92. 8°. Bruxelles, s.a.

Clayton, H. H.—Cloud heights and velocities at Blue Hill Observatory. 8°. (*Amer. Meteor. Journ.*, 1891, *July*, *p.* 108.)

* **Clements, H.**—Holiday weather. 8°. (*Tinsley's Mag.*, 1891, *June*, *p.* 55.)

* ——— The Meteorological Office, London: is it worth 15,000*l.* a year? 8°. (*Tinsley's Mag.*, 1891, *July*, *p.* 167.)

* ——— Newspaper weather. 8°. (*Tinsley's May.*, 1891, *Aug.*, *p.* 225.)

* ——— Meteorological pseudo-science. 8°. (*Tinsley's Mag.*, 1891, *Sept.*, *p.* 337.)

* ——— Weather wisdom. 8°. (*Tinsley's Mag.*, 1891, *Oct.*, *p.* 401.)

* ——— Weather prophesying. 8°. (*Tinsley's Mag.*, 1891, *Nov.*, *p.* 541.)

Coimbra, Observatorio Meteorologico e Magnetico da Universidade.—Observações magneticas . . . de 1878 a 1890. f°. Coimbra, 1891.

——— ——— Observações meteorologicas . . . 1890. f°. Coimbra, 1890.

‖ **Colombo, Surveyor General's Office.**—Report on the meteorology of Ceylon for 1890. sm. f°. (*Ceylon Administr. Rep.*, 1890, *p.* B 1.)

——— ——— Results of meteorological observations in Ceylon during the months of January to December 1890. f°. Sheets. (*Suppl. Ceylon Gov. Gazette*, 1890-91.)

——— ——— Return of rainfall in Ceylon during 1890, and the means during different periods. la. f°. Sheet. (*Suppl. Ceylon Gov. Gazette*, 1891, *June* 5.)

Contarino, F.—Sull' acqua latente del sottosuolo della Città di Napoli nell' anno 1890 ed in epoche anteriori. 8°. Torino, 1891. (*L'Ingegneria Sanitaria*, 1891, *No.* 2.)

* **Cooke, C.**—Curiosities of occult literature. sm. 8°. London, [1863]. With MS. notes by the Author.

Copenhagen, Dansk Meteorologisk Institut.—Bulletin météorologique du Nord, publié par les Instituts météorologiques de Norvége, de Danemark et de Suède. Année 1891. oblong 8°. Copenhague, s.a.

——— ——— Maanedsoversigt over Vejrforholdene. 1891, Jan.—Dec. f°.

——— **Institut Météorologique de Danemark.** — Observations internationales polaires. 1882-83. Expédition Danoise. Aurores boréales observées à Godthaab. Par **A. F. W. Paulsen.** Extrait du Tome I. la. 4°. Copenhague, 1891.

Copenhagen, Kongelige Danske Videnskabernes Selskab.—Oversigt over det . . . . Forhandlinger og dets Medlemmers Arbejder i Aaret 1890. la. 8°. Kjøbenhavn, 1890–91.

* **Copenhagen und Hamburg, Dänisches meteorologisches Institut und Deutsche Seewarte.**—Tägliche synoptische Wetterkarten für den nordatlantischen Ozean und die anliegenden Theile der Kontinente. vi. Jahrg., 1–4 Quart., Dec. 1886—Nov. 1887. 4 vols. f°. Copenhague et Hambourg, 1890–91.

In the French language also.

Cracow, C. K. Akademii Umiejętnósci w Krakowie.—Materyjaly d klimatografii Galicyi zebrane przez sekcyję meteorologiczną komisyi fizyjograficznej. 1890. la. 8°. Kraków, 1891. (*Odbitek ze Sprawozd. Kom. fizyjogr.*)

——— **K. K. Sternwarte in Krakau.**—Meteorologische Beobachtungen. 1891. la. 8°. Krakau, 1891.

* ‖ **Crahay, J. G.**—Mémoire sur les instans du maximum et du minimum de hauteur diurne du baromètre aux diverses saisons pendant le jour. Présenté à la séance du 4 juillet 1835. 4°. [*Mém. Acad. Sc. Bruxelles*, x., 1837.]

* ‖ ——— Mémoire sur la météorologie. 4°. [*Mém. Acad. Sc. Bruxelles*, x., 1837.]

* ‖ ——— Mémoire sur les oscillations diurnes du baromètre. la. 4°. (*Mém. Acad. Sc. Bruxelles*, xvi., 1843.)

‖ **Croydon Microscopical and Natural History Club.**—Report of the meteorological Sub-Committee for 1890. 8°. [*Proc. and Trans. Croydon Microsc. Nat. Hist. Club*, 1891, *p.* 285.]

Contains also "Wandle temperatures," by T. Cushing.

——— ——— [Daily rainfall at stations in Kent and Surrey.] 1891, Jan.—Dec. 4°. Sheets.

* **Dalrymple, D.**—Meteorological and medical observations on the climate of Egypt, with practical hints for invalid travellers. 8°. London, 1861.

* **Dary, G.**—L'électricité dans la nature. sm. 8°. Paris, 1892.

Davos.—Davoser Wetterkarte. Nach dem Schema von Herrn C. Wetzel, Ingenieur, herausgegeben im Auftrag des Curvereins Davos-Platz vom Amtl. Beobachter der Schweiz. meteor. Station Davos. 1891. May—Dec. la. f°. Sheets.

In the French and English languages also.

See also WETZEL, C.

[**Dehra Dun, Surveyor General of India.**]—General report on the operations of the Survey of India Department . . . during 1888–89, 1889–90. Prepared under the direction of Colonel **H. R. Thuillier.** 2 vols. sm. f°. Calcutta, 1890–91.

‖ **Denza, F.**—Piogge singolari. la. 4°. (*Atti. Accad. Pontif. Nuovi Lincei*, xliv., 1890, *Dec.*)

‖ ——— Sulle osservazioni della declinazione magnetica eseguite da Mons. Filippo Gilii alla Specola Vaticana e sulla declinazione magnetica in Roma. sm. f°. Roma, 1891. (*Mem. Pontif. Accad. Nuovi Lincei*, vi.)

‖ ——— Variazioni della temperatura a diverse altezze. la. 4°. Roma, 1890. (*Atti Accad. Pontif. Nuovi Lincei*, xliv., 1890.)

‖ **Devon.**—Report of the Committee on the climate of Devon. Edited by **E. E. Glyde.** 9th (2nd series). 1890. 8°. (*Trans. Devon. Assoc. Adv. Sc.*, xxiii., 1891, *p.* 144.)

Dewar, D.—Weather forecasts. 1892–3. sm. 4°. Dalkeith, *s.a.*

‖ **Dickson, H. N.**—Physical investigations. Preliminary paper. la. 8°. (*Journ. Mar. Biol. Assoc., new series*, ii., *p.* 159.)

‖ ——— Notes on meteorological observations at Plymouth. la. 8°. (*Journ. Mar. Biol. Assoc., new ser.*, ii., *No.* 2, *p.* 171.)

‖ **Dines, W. H.**—A new form of velocity anemometer. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xiii., 1887, *p.* 218.)

‖ ——— Account of some experiments made to investigate the connection between the pressure and velocity of the wind. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xv., 1889, *p.* 183.)

‖ ——— On wind pressure upon an inclined surface. 8°. (*Proc. R. Soc.*, xlviii., 1890, *p.* 283.)

|| **Dines, W. H.**—Report of the Wind Force Committee on the factor of the Kew pattern Robinson anemometer. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvi., 1890, *p.* 26.)

|| ——— On testing anemometers. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvi., 1890, *p.* 41.)

|| ——— Mutual influence of two pressure plates upon each other, and comparison of the pressures upon small and large plates. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvi., 1890, *p.* 205.)

|| ——— On the variations of pressure caused by the wind blowing across the mouth of a tube. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvi., 1890, *p.* 208.)

|| ——— On the pressure of wind on curved vanes. 8°. (*Proc. R. Soc.*, l., 1891, *p.* 42.)

——— Report of the wind force Committee on experiments with anemometers conducted at Hersham.

See Whipple, G. M., and Dines, W. H.

|| **Doering, O.**—La variabilidad interdiurna de la temperatura en algunos puntos de la República Argentina y de America del Sur en general. v. Variabilidad de la temperatura en San Juan (Provincia de Buenos Aires). la. 8°. Buenos Aires, 1890. (*Bol. Acad. Nac. Cienc. Córdoba*, x., *p.* 353.)

——— ——— vi. Variabilidad de la temperatura en la Ciudad de Córdoba. la. 8°. Buenos Aires, 1890. (*Bol. Acad. Nac. Cienc. Córdoba*, xii., *p.* 55.)

Dorpat, Kaiserliche livlandische gemeinnützige und ökonomische Sozietät.—Bericht über die Ergebnisse der Beobachtungen an den Regenstationen. 1888. la. 4°. Dorpat, 1891.

|| **Dove, K.**—Studien über Ostafrika:—

1. Das Klima des inneren Ostafrika.
2. Die Zonen des Kilimandscharo.
3. Die mutmaaslichen Verbreitungsgrenzen der Malaria in Ostafrika.

3 papers. sm. f°. (*Ausland*, 1891, *Nos.* 17, 24, 36.)

Dublin, General Register Office.—Quarterly returns of the marriages, births, and deaths registered in . . . Ireland; . . . . . 1891. 1st—4th quarters, Nos. 109–112. la. 8°. Dublin, 1891–92.

——— ——— Weekly returns of births and deaths in Dublin (including its suburban districts), and in fifteen of the principal urban sanitary districts in Ireland, 1891. la. 8°. Dublin, 1892.

——— **Royal Dublin Society.**—Journal. Vols. i.—vii. 1856–77. 7 vols. 8°. Dublin, 1858–78.

Discontinued.

——— ——— Scientific proceedings. New series, vol. vi. 8°. Dublin, 1888–90.

——— **Royal Irish Academy.**—Proceedings. Third series, vol. i. 8°. Dublin, 1889–91.

* **Duclaux, E.**—Cours de physique et de météorologie professé à l'Institut agronomique. la. 8°. Paris, 1891.

* || **Duprez, F.**—Statistique des coups de foudre qui ont frappé des paratonnerres ou des édifices et des navires armés de ces appareils. Présenté . . . le 5 Déc. 1857. la. 4°. [*Mém. Acad. Sc. Bruxelles*, xxxi., 1859.]

[**Eberswalde, Hauptstation des forstlichen Versuchswesen in Preussen.**]—Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von **A. Müttrich.** Siebzehnter Jahrg. 1891, Jan.—Dec. 8°. Berlin, s.a.

[——— ———] Jahresbericht über die Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von Dr. **A. Müttrich.** xvi. Jahrg., 1890. 8°. Berlin, 1891.

Edinburgh, Royal Society.—Proceedings. Vol. xvii. 1889–90. 8°. Edinburgh, 1891.

|| **Ekholm, N.**—Étude des conditions météorologiques à l'aide de cartes synoptiques représentant la densité de l'air. Note communiquée le 11 Juin 1890. 8°. Stockholm, 1891. (*K. Svenska Vet.-Akad. Handl., Bd.* xvi.)

* || **Élie de Beaumont, L.**—Note sur le rapport qui existe entre le refroidissement progressif de la masse du globe terrestre et celui de sa surface. 4°. (*Compt. rend. acad. sc., Paris,* xix., 1844.)

|| **Elster, J., und Geitel, H.**—Ueber die Entladung negativ electrischer Körper durch das Sonnen- und Tageslicht. 8°. Leipzig, s.a. (*Ann. Phys. Chem., N.F.,* xxxviii., 1889, *p.* 497.)

|| ——— ——— Messungen des normalen Potentialgefälles der atmosphärischen Elektricität in absolutem Maasse. Aus den Sitzungsb. k. Akad. Wissensch. Wien, 1889. sm. f°. (*Meteor. Zeitschr.*, 1890, *Juli, p.* 252.)

|| ——— ——— Beobachtungen, betreffend die elektrische Natur der atmosphärischen Niederschläge. Aus den Sitz.-Ber. Wiener Akad., xcix., 1890. la. 8°. (*Exner's Repert. Phys.*, xxviii., *p.* 69.)

|| ——— ——— Elektrische Beobachtungen auf dem Hohen Sonnblick. Aus den Sitzungsb. k. Akad. Wissensch. Wien, math.-naturw. Kl., xcix., Abth. ii., 1890. sm. f°. (*Meteor. Zeitschr.*, 1891, *Sept., p.* 321.)

|| ——— ——— Ueber die Abhängigkeit der durch das Licht bewirkten Electricitätszerstreuung von der Natur der belichteten Oberfläche. 8°. Leipzig, s.a. (*Ann. Phys. Chem, N.F.,* xliii., 1891, *p.* 225.)

|| ——— ——— Ueber einige Ziele und Methoden luftelektrischer Untersuchungen. 4°. Wolfenbüttel, 1891. (*Wissensch. Beilage Jahresb. Herz. Gymn. Wolfenbüttel,* 1891.)

Emden, Naturforschende Gesellschaft.—Jahresbericht. 75. 1889–90. 8°. Emden, 1891.

England and Wales.—Map showing lines of equal magnetic declination for January 1, 1892. Suppl. to "Colliery Guardian," 1892, Jan. f°. Sheet.

Erk, F.—Die internationale Conferenz der Repräsentanten der meteorologischen Dienste aller Länder in München 26 August bis 2 September 1891. sm. 8°. München, 1891.

|| ——— Die Windhose vom 27 Juni 1890 am Südabhange der Daxsteiner Höhe. la. 4°. München, 1891. (*Beob. meteor. Stat. K. Bayern,* xii., 1890, *p.* lxxxiv.)

Falmouth, Royal Cornwall Polytechnic Society.—Annual report. 58th. 1890. 8°. Falmouth, s.a.

Fiume, K. K. Marine-Akademie.—Meteorologische Beobachtungen. 1891. Jan.—Dec., and Results. la. 8°. Sheets.

* **Flügel, F.**—A universal English-German and German-English Dictionary by F. Flügel. Fourth, entirely remodelled, edition of Dr. J. G. Flügel's complete dictionary of the English and German languages. Two parts in three volumes sm. f°. Brunswick, New York and London, 1891.

|| **Foerster, W.**—Die Erforschung der obersten Schichten der Atmosphäre. 8°. (*Verhandl. Gesellsch. Erdk. Berlin,* 1891, *Heft* 6.)

|| **Folie, F.**—Cirro-stratus et alto-stratus, par J. Vincent. Rapport de M. F. Folie. 8°. (*Acad. R. Belg., Extrait des Bull.,* 3me *série,* xxii., 1891, *No.* 11.)

|| **Fox, W. L.**—Meteorological tables for Falmouth and the Scilly Islands for the year 1890. 8°. Falmouth, s.a. (*Ann. Rep. R. Cornw. Polyt. Soc.*, 1890.)

Frankfurt am Main, Physikalischer Verein.—Jahresbericht . . . für das Rechnungsjahr 1889–1890. 8°. Frankfurt am Main, 1891.

|| **Fry, A.**—Meteorology and its uses at sea. la. 8°. (*Liverpool Shipping Telegraph and Daily Commercial Advertiser,* 1891, *Dec.* 3 *and* 4.)

Geelmuyden, H.—Magnetische Beobachtungen und stündliche Temperaturbeobachtungen im Terminjahre August 1882—August 1883 angestellt auf der Universitätssternwarte in Christiania. Nach dem Tode Prof. Fearnley's herausgegeben von H. Geelmuyden. la. 4°. Christiania, 1891.

Geitel, H. See Elster, J., und Geitel, H.

Geneva, Société de Géographie.—Le Globe. Journal géographique. Tome xxx. la. 8°. Genève, 1891.

* **Gerland, G.**—Atlas der Völkerkunde. (*Berghaus' physikalischer Atlas, Abteilung* vii.) f°. Gotha, 1892.

|| **Glyde, E. E.**—Abstract of meteorological observations made at Kirkham, Babbacombe, Torquay, during the year 1891. f°. Sheet. (*Torquay Directory.*)

Gratz, Naturwissenschaftlicher Verein für Steiermark.—Mittheilungen. 1890. la. 8°. Graz, 1891.

Gray, D.—Report on new whaling grounds in the Southern seas. 8°. Peterhead, 1891.

For private circulation.

Greenwich, Royal Observatory.—Report of the Astronomer Royal to the Board of Visitors. 1891. la. 4°. s.l.e.a.

Greenwood, W. N.—Greenwood's nautical, general, and coasting kludonometric tide tables . . . . 1892. sm. 4°. Lancaster, s.a.

——— Tidal undulations, wave motions, and displacement by atmospheric pressure—the "correlative wave." sm. 8°. (*Greenwood's Kludonometric Pocket Tide Tables*, 1891, *p.* 19.)

Hall, M.—The rainfall of Jamaica. Thirteen maps showing the average rainfall in each month and during the year, with explanatory text. By M. Hall. Special publications of the Institute of Jamaica. No. 1. sm. f°. Kingston, 1891.

Halle, Kaiserliche leopoldino-carolinische deutsche Akademie der Naturforscher.—Leopoldina. Heft xxvi. 1890. la. 4°. Halle, 1890.

|| **Hamberg, H. E.**—La radiation des nuages supérieurs autour des minima barométriques. 8°. Stockholm, 1891. (*Svenska Vet.-Akad. Handl.*, xvii., *Afd.*, *No.* 3.)

Hamburg, Deutsche Seewarte.—Aus dem Archiv der Deutschen Seewarte xiii. Jahrg., 1890. la. 4°. Hamburg, 1891.

——— ——— Deutsches meteorologisches Jahrbuch für 1890. Beobachtungs-System der Deutschen Seewarte. Ergebnisse der meteorologischen Beobachtungen . . . Jahrg. xiii. sm. f°. Hamburg, 1891.

——— ——— Ergebnisse der meteorologischen Beobachtungen im Systeme der Deutschen Seewarte für das Lustrum 1886–1890. f°. Hamburg, 1891.

——— ——— Katalog der Bibliothek der Deutschen Seewarte zu Hamburg. la. 8°. Hamburg, 1890.

——— ——— Monatsbericht der Deutschen Seewarte für jeden Monat des Jahres 1890. Jahrg. xv. la. 8°. Hamburg, s.a.

——— ——— Vierteljahrs-Wetter-Rundschau an der Hand der täglichen synoptischen Wetterkarten für den nordatlantischen Ocean des Dänischen meteorologischen Instituts und der Deutschen Seewarte. Bd. iii. 1885–86. la. 8°. Berlin, 1891.

——— ——— Wetterbericht. Jahrg. xvi. 1891, Jan. 1.—Dec. 31. f°. Sheets.

Hammon, W. H.—Meteorological observations taken in four balloon voyages. la. 8°. (*Amer. Meteor. Journ.*, vii., 1891, *p.* 498.)

* **Handl, A.**—Uebersicht über die Temperatur-Verhältnisse in Lemberg, im Zeitraume 1824–1870. Verlag des technischen Vereins in Lemberg. f°. s.l.e.a.

|| **Hann, J.**—Die Veränderlichkeit der Temperatur in Österreich. la. 4°. Wien, 1891. (*Denkschr. math.-naturw. Cl. k. Akad. Wissensch.*, lviii., *p.* 99.)

——— Zum Klima des westlichen Pacific. Futuna, Tongatabu. sm. f°. (*Meteor. Zeitschr.*, 1891, *April*, *p.* 136.)

——— Resultate der meteorologischen Beobachtungen zu San José de Costa Rica im Jahre 1889. sm. f°. (*Meteor. Zeitschr.*, 1891, *Apl.*, *p.* 142.)

——— Zum Klima des Staates São Paulo, Brasilien. sm. f°. (*Meteor. Zeitschr.*, 1891, *Apl.*, *p.* 144.)

|| ——— Die meteorologischen Beobachtungen des Prof. A. Ackermann in Port au Prince, Haiti. 1864–1868. sm. f°. (*Meteor. Zeitschr.*, 1889, *Juni*, *p.* 209.)

——— Studien über die Luftdruck- und Temperaturverhältnisse auf den Sonnblickgipfel, nebst Bemerkungen über die Bedeutung derselben für die Theorie der Cyclonen und Anticyclonen. la. 8°. [*K. Akad. Wissensch., Wien, Sitz. math.-naturw. Cl.*, 1891, *p.* 65.]

|| ——— Studien über die Luftdruck- und Temperaturverhältnisse auf dem Sonnblickgipfel, nebst Bemerkungen über deren Bedeutung für die Theorie der Cyclonen und Anticyclonen. la. 8°. Wien, 1891. (*K. Akad. Wissensch. Wien, Sitzungsb. math.-naturw. Cl., Bd. c., Abth.* ii., 1891, *p.* 867.)

Hansa.—Zeitschrift für Seewesen. Redigirt und herausgegeben . . . von W. von Freeden. xxxviii. Jahrg. 1891. sm. f°. Hamburg, 1891.

‖ **Harding, C.**—The great frost of 1890–1891. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xvii., 1891, *p.* 93.)

[Harries, H.]—Cold. 8°. (*Cornhill Mag.*, 1892, *Jan.*, *p.* 80.)

Harrington, M. W.—The new weather service and international meteorology. la. 8°. (*Amer. Meteor. Journ.*, vii., 1891, *p.* 582.)

Havana, Real Colegio de Belen de la Compañia de Jesus.—Observaciones magnéticas y meteorológicas. 1888. f°. Habana, 1890.

* **Haviland, A.**—Climate, weather, and disease; being a sketch of the opinions of the most celebrated antient and modern writers with regard to the influence of climate and weather in producing disease. la. 8°. London, 1855.

‖ **Hayden, E.**—The Samoan hurricane of March 1889. la. 8°. (*Proc. U.S. Naval Inst.*, xvii., *p.* 283.)

Hazell's Annual for 1889, 1891 : a cyclopædic record of men and topics of the day. Edited by **E. D. Price.** 2 vols., sm. 8°. London, 1889, 1891.

‖ **Hellmann, G.**—Die erste Ballonfahrt zu wissenschaftlichen Zwecken. la. 8°. (*Zeitschr. Luftschiff. u. Phys. Atmos.*, 1892, *Jan.*, *No.* 1.)

‖ ——— Meteorologische Volksbücher. Ein Beitrag zur Geschichte der Meteorologie und zur Kulturgeschichte. Sammlung populärer Schriften herausgegeben von der Gesellsch. Urania zu Berlin, No. 8. la. 8°. Berlin, 1891. (*Himmel und Erde*, iii. *Jahrg.*, 9–11 *Heft.*)

Helsingfors, Finska Vetenskaps-Societeten. — Öfversigt af Finska Vetenskaps-Societetens Förhandlingar. xxxii. 1889–90. la. 8°. Helsingfors, 1890.

——— **Institut Météorologique Central de la Société des Sciences de Finlande.**—Observations. Vol. ix., 1890. f°. Helsingfors, 1891.

Vols. iii.–viii. not yet published.

Hildebrandsson, H. H.—Rapport sur la classification des nuages. la. 8°. Versailles, 1891.

‖ ——— Ueber den Werth der Messungen von Zugrichtung und Höhe der Wolken für die meteorologische Wissenschaft. Bemerkungen zur Frage No. 14 der Systematische Zusammenstellung der Fragen für die internat. meteor. Konferenz in München 1891. la. 4°. (*Aus dem Archiv Deutschen Seewarte*, 1891, *No.* 5.)

* **Himmel und Erde.**—Illustrirte naturwissenschaftliche Monatsschrift. Herausgegeben von der Gesellschaft Urania. Redacteur: M. W. Meyer. iii. Jahrg. la. 8°. Berlin, 1891.

Hobart, Royal Society of Tasmania.—Papers and proceedings . . . for 1890. 8°. Hobart, 1891.

* **Hoernes, H.**—Ueber Ballonbeobachtungen und deren graphische Darstellung mit besonderer Berücksichtigung meteorologischer Verhältnisse. Im Anhange. Ausgeführte Ballonreisen zu wissenschaftlichen Zwecken. 8°. Wien, Pest, Leipzig, 1892.

Hong-Kong Observatory.—Observations. 1889, 1890. 2 vols. f°. Hong-Kong, 1891.

Hoogewerff, J. A.—Magnetic observations at the United States Naval Observatory.

See Washington, United States Naval Observatory.

‖ **Hopkinson, J.**—Water and water-supply, with special reference to the supply of London from the chalk of Hertfordshire. 8°. Hertford, 1891. (*Trans. Herts. Nat. Hist. Soc.*, vi., *Part* 5, 1891, *p.* 129.)

‖ **Horn, F., und Tillmann, C.**—Beobachtungen über Gewitter in Bayern, Württemberg, Baden und Hohenzollern während des Jahres 1890. la. 4°. München, 1891. (*Beob. meteor. Stat. K. Bayern*, xxii., 1890, *p.* lx.)

Hornberger, R.—Grundriss der Meteorologie und Klimatologie, letztere mit besonderer Rücksicht auf Forst- und Landwirte. la. 8°. Berlin, 1891.

International Meteorological Committee.—Systematic arrangement of all the questions which have not been decided either at all or at least not definitely by the International Meteorological Committee, together with the questions comprised in the provisional programme for the International Meteorological Conference at Munich, 1891. la. 8°. London, 1891.

Irkutsk, Observatorium.—Die Beobachtungen des meteorologischen und magnetischen Observatoriums in Irkutsk im Jahre 1889. la. 4°. [*Annal. phys. Central-Obs. St. Petersb.*, 1889, *Theil* i.]

Ithaca, New York Meteorological Bureau.—Annual report of Commissioners of the State Meteorological Bureau and Weather Service. 1st and 2nd. 1888–90. 2 vols. la. 8°. Albany, 1890–91.

——— ——— Report. 1891, Jan.—Dec. la. 4°. s.l.e.a.

Jamaica.—Jamaica rainfall from 1870 to 1889. (By **M. Hall.**) f°. Kingston, 1892.

No. 124A of Jamaica Weather Report.

‖ ——— Weather report for the months of Jan.—Dec. 1891. sm. f°. Kingston, 1891–92. (*From the Jamaica Gazette.*)

Jenkins, B. G.—The British Weather Chart, 1892. Oblong la. 8°. London, s.a.

* **Johnston, R.**—The arctic expedition of 1875–6, compiled from official sources, with a summary of previous adventures in the arctic seas. 8°. London, s.a.

‖ **Kammermann, A.**—Résumé météorologique de l'année 1890 pour Genève et le Grand Saint-Bernard. 8° Genève, 1891. (*Arch. Sc. Phys. Nat.*, 1891, *Sept., Oct.*)

‖ **Kew Observatory.**—Appendix to the report of the Kew Committee for the year ending December 31, 1890. Containing results of magnetical, meteorological, and solar observations made at the Observatory. 8°. London, 1890. (*Proc. R. Soc.*, 1890.)

——— ——— Report of the Kew Committee for the fourteen months ending December 31, 1891. 8°. London, 1892. (*Proc. R. Soc.*, 1892.)

Kiel, Kommission zur wissenschaftlichen Untersuchung der deutschen Meere.—Atlas deutscher Meeresalgen. i....ii. Heft. 2 vols. f°. Berlin, 1889, 1892.

——— **Ministerial-Kommission zur Untersuchung der Deutschen Meere.**—Ergebnisse der Beobachtungsstationen an den deutschen Küsten über die physikalischen Eigenschaften der Ostsee und Nordsee und die Fischerei. Jahrg. 1890. Heft i.—xii. Oblong 8°. Berlin, s.a.

Klengel, F.—Die historische Entwickelung des Begriffs der Schneegrenze von Bouguer bis auf A. v. Humboldt, 1736–1820. Veröffentlicht vom Verein für Erdkunde in Leipzig. 8°. Leipzig, 1889.

Klossovsky, A.—Revue météorologique. Travaux du réseau météorologique du sud-ouest de la Russie.

See Odessa, Observatoire Météorologique de l'Université.

Krasno, agrarmeteorologisches Observatorium des Neutrathaler landwirtschaftlichen Vereines.—Der Laubfrosch. IV. Jahrg., 1891. VIII. Jahrg. der populären meteor. Abhandlungen . . . Redigirt durch **Frh. G. Friesenhof.** la. 4°. Alt-Krasno, 1891.

——— ——— Wetterkalender für Ungarn. 1891. Jahrg. viii. Nos. 1–28. sm. 4°. Sheets.

——— **agrarmeteorologisches Observatorium zu Alt-Krasno (vordem Nedanócz).**—Monatsberichte 1891 über die regelmässigen Beobachtungen. Jan.—Dez. la. 4°. Alt-Krasno, 1891.

Lagos, Colonial Surgeon.—Meteorological observations taken at the Colonial Hospital, Lagos. 1891, Jan.—Dec. f°. Sheets. (*Gov. Gazette*, 1890.)

Lahore, Meteorological Reporter to Government, Punjab.—Summary of meteorological conditions prevailing over the Punjab. 1891. Jan.—Dec. f°. Sheets.

——— **Sanitary Commissioner.**—Report on the sanitary administration of the Punjab for the year 1890. f°. Lahore, 1891.

‖ **Lang, C.**—Eine Skizze über Witterung und Influenza. la. 4°. ("*Ausland*," 1892, *Nr.* 4 *u.* 5.)

‖ ——— Säculare Schwankungen der Blitz- und Hagelgefahr. la. 4°. (*Beob. meteor. Stat. K. Bayern*, xii., 1890, *p.* liii.)

|| **Lang, C.**—Die Fortpflanzungsgeschwindigkeit der Gewitter in Süddeutschland während des Jahres 1890. la. 4°. München, 1891. (*Beob. meteor. Stat. K. Bayern*, xii., 1890, *p.* lxix.)

|| ——— La prévision du temps. la. 8°. Bruxelles, 1891. (*Ciel et Terre*, xii., 1891-92, *pp.* 457, 481.)

——— **und Singer, K.**—Die Schneedecke in Bayern im Winter 1889-90. 4°. (*Beob. meteor. Stat. K. Bayern*, xii., 1890, *p.* 137.)

Laschober, F., und Kesslitz, W. — Magnetische Beobachtungen an den Küsten der Adria in den Jahren 1889 und 1890 auf Anordnung des k. und k. Reichs-Kriegs-Ministeriums (Marine Section). Beilage zu den Mittheil. aus dem Gebiete des Seewesens. la. 4°. Pola, 1892.

Lawes, J. B., and Gilbert, J. H.—Effects of the drought of 1870 on some of the experimental crops at Rothamsted. 8°. (*Journ. R. Agric. Soc. Engl.*, 2*nd ser.*, vii., *Part* i., *p.* 91.)

* || **Leclercq, D.**—Note sur la formation de la glace dans les eaux courantes. la. 4°. [*Mém. Couronn, Bruxelles*, xviii., 1844-45.]

Leeward Islands. — Annual report for 1890. Colonial reports (annual). No. 22. la. 8°. London, 1891.

Leyst, E. — Ueber den Einfluss der Temperatur des Quecksilberfadens bei gewissen Maximum-Thermometern und feuchten Psychrometer-Thermometern. la. 4°. (St. Petersburg, 1891.) (*Repert. Meteor.*, xiv.)

|| ——— Über die Berechnung von Temperatur-Mitteln aus Beobachtungen zu den Terminen 8 Uhr Vm., 2 Uhr und 8 Uhr Nm. Der Akad. vorgelegt am 4 Dec. 1891. sm. f°. St. Petersburg, 1892. (*Repert. Meteor.*, xv., *No.* 3.)

* || **Liagre, J.**—De l'influence des phases lunaires sur la pression atmosphérique. Présenté . . . le 4 août 1855. la. 4°. [*Mém. Acad. Sc. Bruxelles*, xxx., 1857.]

|| **Lingg, F.**—Meteore und Erdbeben im Jahre 1890. la. 4°. München, 1890. (*Beob. meteor. Stat. K. Bayern*, xii., 1890, *p.* lxxxvii.)

Lisbon, Observatorio Do Infante D. Luiz.— Boletim meteorologico. 1891, Jan. 1—Dec. 31. f°. Sheets.

Lloyd's Seaman's Almanac.—1892. 8°. Glasgow, 1892.

|| **Loefgren, A.**—Dados climatologicos do anno de 1889. la. 8°. S. Paulo, 1890. (*Bol. Comm. Geogr. e Geol. Estado de S. Paulo, I., No.* 6, *p.* 206.)

London, Admiralty.—Tide tables for the British and Irish Ports, for the year 1892; also the times and heights of high water at full and change for the principal places on the Globe. la. 8°. London, s.a.

* ——— ——— **Hydrographic Office.**—The Channel Pilot. Part i., South-west and south coasts of England. 7th ed. Part ii. Coast of France, and the Channel Islands. 5th ed. 2 vols. la. 8°. London, 1886-87.

* ——— ——— ——— North Sea Pilot. Part i., Shetland and Orkneys. 3rd ed. Part ii., North and East Coasts of Scotland. 4th ed. Part iii., East Coast of England. 5th ed. Part iv., Rivers Thames and Medway, and the shores of the North Sea from Calais to the Skaw. 4th ed. 4 vols. la. 8°. London, 1885, 1887, 1889.

* ——— ——— ——— Sailing directions for the Bristol Channel. Fourth edition. la. 8°. London, 1884.

* ——— ——— ——— Sailing directions for the West Coast of England, from Milford Haven to the Mull of Galloway, including the Isle of Man. Third edition. la. 8°. London, 1884.

* ——— ——— ——— Sailing directions for the coast of Ireland. Part i., South, East, and North Coasts of Ireland. 3rd ed. Part ii., South-West, West, and North-West Coasts. 3rd ed. 2 vols. la. 8°. London, 1885, 1887.

* ——— ——— ——— Sailing directions for the West Coast of Scotland. Part i. Hebrides or Western Isles. 3rd ed. Part ii., Cape Wrath to the Mull of Galloway. 3rd ed. 2 vols. la. 8°. London, 1885-86.

——— **Army Medical Department.**—Annual abstract of meteorological observations taken at Netley and foreign stations in the year 1889. la. 8°. (*Army Med. Dep. Rep.*, 1889, *App.* xi., *p.* 434.)

London, Board of Trade.—Abstracts of the returns made to the Board of Trade of shipping casualties . . . from the 1st July 1889 to the 30th June 1890; . . . with charts and appendices. sm. f°. London, 1891.

——— **British Association for the Advancement of Science.**—Reports. Leeds, 1890. Cardiff, 1891. 2 vols. 8°. London, 1891-92.

——— **Edinburgh, and Dublin Philosophical Magazine** and Journal of Science. Fifth series. Vols. xxxi.-xxxii., 1891. 2 vols. 8°. London, s.a.

——— **General Register Office.**—Annual report of the Registrar-General of births, deaths, and marriages in England. 1890. 53rd. la. 8°. London, 1891.

——— ——— Quarterly returns of marriages, births and deaths registered in . . . England, Nos. 169-172, 1891. la. 8°. London, 1891-92.

——— ——— Weekly return of births and deaths in London and . . . other great towns. Vol. lii., 1891. la. 8°. London, 1891.

*(——— **Geological Survey Office.**)—Memoirs of the Geological Survey. England and Wales. The geology of London and of part of the Thames Valley. By **W. Whitaker.** Vols. i. and ii. 2 vols. la. 8°. London, 1889.

(——— **Meteorological Office.**)—Cyclone tracks in the South Indian Ocean from information compiled by Dr. Meldrum. oblong la. f°. London, 1891.

——— ——— Daily weather charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. la. 4°. London, 1891.

——— ——— Daily weather report. 1891, Jan. 1—Dec. 31. 2 vols. la. 4°. s.l.e.a.

——— ——— Harmonic analysis of hourly observations of air temperature and pressure at British Observatories. la. 4°. London, 1891.

——— ——— Hourly means of the readings obtained from the self-recording instruments at the four observatories under the Meteorological Council. 1887, 1888. 2 vols. la. 4°. London, 1891.

——— ——— Instructions for meteorological telegraphy. Prepared for the use of Observers exclusively. la. 8°. London, 1891.

——— ——— Meteorological charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras Hafún. oblong f°. London, 1891.

——— ——— Meteorological observations at stations of the second order for the year 1887. la. 4°. London, 1891.

——— ——— The quarterly weather report. 1890. la. 4°. London, 1891.

——— ——— Report of the Meteorological Council to the Royal Society, for the year ending 31st of March, 1891. la. 8°. London, 1892.

——— ——— Ten years sunshine in the British Isles, 1881-1890. la. 8°. London, 1891.

——— ——— The weekly weather report of the Meteorological Office for the year 1891 (vol. viii., third series), containing synoptic charts, and descriptive summaries of the weather for each day; also tabular summaries of temperature, rainfall, and bright sunshine, for each week, with monthly supplements and two appendices. la. 4°. London, 1891.

This should be Vol. ii., third series.

——— **Royal Astronomical Society.**—Monthly notices . . . li. 8°. London, 1891.

——— **Royal Geographical Society.**—Proceedings . . . and monthly record of geography. New monthly series. Vol. xiii., 1891. la. 8°. London, 1891.

——— **Royal Meteorological Society.**—The meteorological record. Monthly results of observations made at the stations of the R. Meteor. Soc., with remarks on the weather for the year 1890. By **W. Marriott.** Vol. x. la. 8°. London, 1891.

Contains also "Meteorology of England during the quarters ending March to December 1890." By J. Glaisher.

——— ——— Quarterly Journal. Vol. xvii., 1891. la. 8°. London, 1891.

——— **Royal Society.**—Catalogue of scientific papers (1874-1883). Vol. ix. 4°. London, 1891.

——— ——— Proceedings. Vol. xlix., 1890-91. 8°. London, 1891.

——— **Royal United Service Institution.**—Journal. Vol. xxxv. 8°. London, 1891.

London, Society of Arts.—Journal. Vol. xxxix, 1890–91. la. 8°. London, 1890.

McAdie, A.—Mean temperatures and their corrections in the United States.
See WASHINGTON, SIGNAL OFFICE.

McLandsborough, J., and Preston, A. E.—Meteorology of Bradford for 1891. f°. Sheet.

(Madras, Meteorological Office.)—Administration reports of the Meteorological Reporter to the Government of Madras, for the years 1886–87–1889–90. 4 vols. la. 8°. Madras, 1887–91.

Madrid, Observatorio. — Resumen de las observaciones meteorológicas efectuadas en la Peninsula y algunas de sus islas adyacentes durante los años 1887 y 1888. 2 vols. 8°. Madrid, 1890–91.

Magdeburg.—Jahrbuch der meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung. Herausgegeben von **A. W. Grützmacher.** Bd. ix., Jahrg. x., 1890. la. 4°. Magdeburg, 1891.

* **Mairan, J. J. d'Ortous de.**—Traité physique et historique de l'aurore boréale. Seconde édition, revûe, et augmentée de plusieurs éclaircissemens. Suite des Mém. Acad. R. des Sciences, année 1731. 4°. Paris, 1754.

Major, F.—Spacial and atomic energy. Part iii. Heat. 8°. London, 1891.

Manchester, Literary and Philosophical Society.—Memoirs and proceedings. 4th series, vol. iv. 8°. Manchester, 1891.

——— **Sheffield, and Lincolnshire Railway.**—Monthly statement of rain fallen in the year ending 31st December, 1891. la. 4°. Sheet.

Manila, Observatorio Meteorologico.—Observaciones verificadas. 1890. sm. f°. Manila, 1890.

Manson, M.—Physical and geological traces of permanent cyclone belts. 8°. (*Trans. Techn. Soc. Pacific Coast*, viii.)

Margate, Medical Officer of Health.—Annual report on the health of Margate for the year 1890, by the Medical Officer of Health. la. 8°. Margate, 1891.

Marseilles, Commission de Météorologie du Département des Bouches-du-Rhone.—Bulletin annuel. Année 1890. 9me année. 4°. Marseille, 1891.

* **Maudslay, A.**—Nature's weather warnings and natural phenomena. sm. 8°. London, 1891.

Mauritius, Royal Alfred Observatory.—Annual report of the Director . . . for the year 1889. sm. f°. s.l.e.a.

Melbourne Observatory.—Monthly record of results of observations in meteorology, terrestrial magnetism, &c., &c., . . . 1890, Jan. — Dec. la. 8°. Melbourne, s.a.

——— ——— Report of the Board of Visitors to the Observatory; together with the annual report of the Government Astronomer. 26th. sm. f°. Melbourne, 1891.

* **Merle, Rev. W.**—Consideraciones temperiei pro 7 annis. The earliest known journal of the weather: kept by the Rev. W. Merle, Rector of Driby, Lincolnshire. 1337–1344. Reproduced and translated under the supervision of **G. J. Symons.** f°. London, 1891.

Meteorologische Zeitschrift—Herausgegeben im Auftrage der **Oesterreichischen Gesellschaft für Meteorologie und der Deutschen meteorologischen Gesellschaft.** VIII. Jahrg. (xxvi. Bd. d. Zeitschr. oesterr. Gesellsch. Meteor.), 1891. la. 8°. Wien, s.a.

Mexico, Ministerio de Fomento.—Anales. Tomo ix. la. 8°. México, 1891.

——— **Sociedad Cientifica "Antonio Alzate."** — Memorias. Tom. iv., 1890–91. 8°. México, 1890.

Milan, R. Osservatorio Astronomico di Brera in Milano.—Osservazioni meteorologiche eseguite nell' annos 1890, 1891, col riassunto composto sulle medesime da **E. Pini.** 2 vols. sm. f°. s.l.e.a.

|| **Mill, H. R.**—Fourth and final report of the Committee appointed to arrange an investigation of the seasonal variations of temperature in lakes, rivers, and estuaries in various parts of the United Kingdom . . . . Drawn up by Dr. H. R. Mill. 8°. London, s.a. (*Rep. Br. Assoc. Advanc. Sc.*, 1891.)

* ——— The realm of nature. An outline of physiography. sm. 8°. London, 1892.

Monaco, Prince Albert Ier. de.—Sur une nouvelle carte des courants de l'Atlantique Nord. 4°. (*Compt. rend. acad. sc. Paris*, cxiv., 1892.)
With la. f°. Chart.

* || **Montigny, [C.].**—Corrélation des hauteurs du baromètre et de la pression du vent. Lu . . . 5 fév. 1853. la. 4°. (*Mém. Couronn., Bruxelles*, xxvi.)

Montreal, Geological and Natural History Survey of Canada.—Annual report. New series, vol. iv., 1888–89. la. 8°. Montreal, 1890.

Morize, H.—Esboço de uma climatologia do Brazil.
See Rio de Janeiro, Observatorio.

Munich, K. [b.] meteorologische Centralstation.—Beobachtungen der meteorologischen Stationen im Königreich Bayern . . . xii. Jahrg., 1890. sm. f°. München, 1891.

|| ——— ——— Uebersicht über die Witterungsverhältnisse im Königreiche Bayern. 1891, Jan.—Dec. la. f°. Sheets. (*Separat-Abdruck aus der "Augsburger-Abendzeitung."*)

——— ——— Wetterkarte und Wetterbericht. 1891, Jan. 1—Dec. 31. oblong f°. Sheets.

* **Nares, (G. S.).**—The official report of the recent Arctic Expedition. 8°. London, 1876.

* **Nature.**—A weekly illustrated journal of science. Vols. xliii.-xliv. 1890-91. 2 vols. la. 8°. London and New York, 1891.

* **Nature, La.**—Revue des sciences et de leurs applications aux arts et à l'industrie. Journal hebdomadaire illustré. xix^{e} année, 1891. 1er et 2^{e} Semestres. 2 vols. sm. f°. Paris, s.a.

* **Nautical Magazine** for 1891. New series. A journal of papers on subjects connected with maritime affairs. Vol. lx. 8°. London, s.a.

* **Neumayer, G.** — Atlas des Erdmagnetismus. (*Berghaus' Physikalischer Atlas, Abteilung* iv.) f°. Gotha, 1891.

——— Über die Bedeutung und Ziele erdmagnetischer Landesvermessungen. la. 8°. Berlin, 1891. (*Verhandl. Deutsch. Geographentages, Wien*, ix., 1891.)

New Guinea.—Map of British New Guinea shewing part of Kaiser Wilhelms-Land. Compiled in the Intelligence Division, War Office. 1890. la. f°. Sheet.

New York, American Geographical Society.—Journal. Vol. xxiii., 1891. la. 8°. New York, s.a.

——— **Meteorological Observatory.**—Report. 1890. 4°. New York, 1890.

Nice, Société de Médecine et de Climatologie de Nice.—Nice-Médical. 15^{e} Année, 1890–91, Nos. 1–12. la. 8°. Nice, 1890-91.

Nipher, F. E.—[Bulletin of the] Missouri Weather Service. 1890, Jan.–Nov. 4°.
Discontinued.

Nowack, J. F.—J. F. Nowack's new system of meteorological and telluric forecasts for land and sea. 8°. London, 1892.
For private circulation only.

(Odessa, Observatoire Météorologique de l'Université.)—Revue météorologique. Travaux du réseau météorologique du sud-ouest de la Russie l'année 1890. Vol. i. Rédigé par **A. Klossovsky.** la. 4°. Odessa, 1891.
In the Russian language also.

|| **Oliver, F. W.**—On the effects of urban fog upon cultivated plants. Preliminary report presented . . . March 24, 1891. 8°. (*Journ. R. Hort. Soc.*)

|| **Omond, R. T., and Rankin, A.**—The winds of Ben Nevis. la. 4°. Edinburgh, 1891. (*Trans. R. Soc. Edinb.*, xxxvi., *Part* ii., *p.* 537.)

* **Optician, The.** — The organ of the optical, mathematical, philosophical, electrical, nautical, and photographic instrument industries. Vol. i. 4°. London, 1891.

Palmieri, L.—Sul seguente programma proposto dalla R. Acad. delle Sc. di Lisbona du procédé le plus simple et le plus exact pour reconnaître et mesurer l'électricité de l'air dans toutes les conditions atmosphériques. 4°. (*Mem. Acad. R. Sc. Lisboa*, 1ª *Cl.*, ii., *Part* ii., 1861.)

* **Paris.**—Congrès météorologique international, tenu à Paris du 19 au 26 Septembre 1889. I. Procès-Verbaux sommaires. II. Mémoires. 2 vols. la. 8°. Paris, 1889.

——— **Académie des Sciences.**—Comptes-Rendus hebdomadaires des séances. . . . Tomes cxii.-cxiii., 1891. 2 vols. 4°. Paris, 1891.

——— **Bureau Central Météorologique de France.**—Annales . . . publiées par **E. Mascart.** Année 1889. i.-iii. 3 vols. la. 4°. Paris, 1891.

——— ——— Bulletin international. xxxvᵉ. Année, 1891. Jan. 1—Dec. 31. 4°.

——— **Comité International des Poids et Mesures.**—Procès-Verbaux des séances de 1890. 8°. Paris, 1891.

——— ——— Quatorzième rapport aux Gouvernements Signataires de la Convention du Mètre sur l'exercice de 1890. sm. fº. Paris, 1891.

——— **Ministère de la Marine et des Colonies.**—Revue maritime et coloniale. Tomes cix.-cxii. 4 vols. la. 8°. Paris, 1891–92.

——— **Observatoire Municipal de Montsouris.**—Annuaire . . . pour l'an 1891. 18°. Paris, s.a.

——— **Service Hydrographique de la Marine.**—Annales hydrographiques. 2ᵉ sér., Tomes xii.-xiii., 1890–91. la. 8°. Paris, 1890–91.

——— **Service Hydrométrique du Bassin de la Seine.**—Observations sur les cours d'eau et la pluie centralisées pendant l'année 1890 . . . 7 plates. fº. Versailles, s.a.

‖ ——— ——— Résumé des observations centralisées . . . pendant l'année 1890 . . . la. 8°. Versailles, 1891. (*Ann. soc. météor. Fr.*, xl., 1892, *Janv.*)

——— **Société Météorologique de France.**—Annuaire. Tome xxxviii. 8°. Paris, s.a.

‖ **Paulsen, A.**—Déterminations de la déclinaison magnétique en Danemark. la. 8°. Copenhague, 1891. (*Bull. acad. R. Danoise Sc. et Lettr.*, 1891, *p.* 116.)

——— **A. F. W.**—Aurores boréales observées à Godthaab.

See COPENHAGEN, INSTITUT MÉTÉOROLOGIQUE DE DANEMARK.

* **Pearce, A. J.**—The weather and its prediction. 8°. (*Urania*, i., 1880, *p.* 6.)

Peek, C. E.—Meteorological observations for the year 1890, together with the reduction of observations for the lustrum 1886–90. Rousdon Observatory, Devon. Vol. vii. 4°. London, 1891.

Peking, Inspectorate General of Customs.—Medical reports, for the half-year ended 31st March 1889. 37th issue. 4°. Shanghai, 1891.

‖ **Pernter, J. M.**—Die Windverhältnisse auf dem Sonnblick und einigen anderen Gipfelstationen. Vorgelegt . . . . 18 Dec., 1890. la. 4°. Wien, 1891. (*Denkschr. math.-naturw. Cl. k. Akad. Wissensch.*, lviii., *p.* 208.)

* ——— Falbs kritische Tage. Sammlung populärer Schriften herausgegeben von der Gesellsch. Urania zu Berlin, No. 10. la. 8°. Berlin, 1892.

Pesth, Königl. Ung. Central-Anstalt für Meteorologie und Erdmagnetismus.—Jahrbücher. xviii.-xix. Bd., Jahrg. 1888–89. 2 vols. 4°. Budapest, 1890–91.

In the Hungarian language also.

Petermann's (Dr. A.) Mitteilungen aus Justus Perthes' geographischer Anstalt. Herausgegeben von **A. Supan.** 37 Bd., 1891. 4°. Gotha, s.a.

Philadelphia, American Philosophical Society.—Proceedings of the American Philosophical Society held at Philadelphia for promoting useful knowledge. Vol. xxix., 1891. la. 8°. Philadelphia, 1891.

Philadelphia, Franklin Institute.—The journal of the Franklin Institute, devoted to science and the mechanic arts. Vols. cxxxi.-cxxxii., 1891. 2 vols. 8°. Philadelphia, 1891.

* **Philotechnus.**—Remarks, for a series of years, on barometrical scales, shewing they are inadequate to predict the weather; the results of these observations exhibited and corrected upon a new and enlarged plan. As also, an improvement proposed on the rain-gage (*sic*); with a few hints of the effects on the weather by the different directions of the wind. Principally intended for the use of the Farmer. 8°. Edinburgh, 1814.

Pola, hydrographisches Amt der k. k. Kriegsmarine.—Meteorologische und magnetische Beobachtungen. 1891, Jan.—Dec., and Results. oblong la. 8°.

——— **K. K. hydrographisches Amt.**—Mittheilungen aus dem Gebiete des Seewesens. Jahrg. 1891. xix. Band. la. 8°. Pola, 1891.

Contains also some unnumbered pages of meteorological observations recorded at Pola during 1890–91.

‖ **Port au Prince, Haiti.**—Tägliche meteorologische Beobachtungen im Jahren 1888–89, angestellt am Petit Séminaire Collège, St. Martial. la. 4°. (*Jahrb. k. k. Central-Anst. Meteor., Wien*, 1888, *p.* 121; 1889, *p.* 121.)

Porto Rico, Jefatura de Obras Públicas de la Isla de Puerto Rico.—Resúmen de las observaciones meteorológicas verificadas. 1891. Jan.—Dec. 8°. Sheets.

‖ **Pouchet, G.**—Nouvelles observations sur la sardine océanique. 4°. (*Compt. rend. acad. sc. Paris*, cxii., 1891, *p.* 744.)

——— Rapport à M. le Ministre de l'Instruction publique sur le fonctionnement du Laboratoire de Concarneau en 1889 et sur la sardine. la. 8°. (Coulommiers, s.a.) (*Journ. Anat. et Physiol.*, 1890, *Nov.—Dec.*)

* **Powers, E.**—War and the weather. Revised edition. sm. 8°. Delavan, Wis., 1890.

Prague, K. K. Sternwarte.—Magnetische und meteorologische Beobachtungen . . . . 1890. 51 Jahrg. la. 4°. Prag, 1891.

——— **Technisches Bureau des Landesculturrathes für das Königreich Böhmen.**—Ergebnisse der ombrometrischen Beobachtungen in Böhmen für das Jahr 1890. 4°. Prag, 1891.

In the Hungarian language also.

——— ——— Ergebnisse der Wasserstandsbeobachtungen an den Flüssen Böhmens für das Jahr 1890. 4°. Prag, 1891.

In the Hungarian language also.

Puebla, Observatorio Meteorológico del Colegio del Estado de Puebla.—Resúmen correspondiente a cada dia. 1891, Jan.—Dec. sm. f°.

Ragona, D.—Gli osservatorii meteorologici di montagna. Letta (in francese) nel giorno 19 Sett. 1891, innanzi alle due sezioni riunite di fis. e di meteor. del Congr. tenuto in Marsiglia dalla Assoc. franç. avanc. sc. 8°. Modena, 1891.

‖ **Raulin, V.**—Sur les observations pluviométriques de M. H. Carlier à Saint-Martin-de-Hinx (Landes). la. 8°. (*Ann. Soc. Météor. France*, xxxix., 1891, *p.* 89.)

Riggenbach, A.—Collectanea zur Basler Witterungsgeschichte. Wissensch. Beilage zum Bericht über das Gymnasium, Schuljahr 1890–91. 4°. Basel, 1891.

‖ ——— Die Niederschlags-Verhältnisse von Basel. la. 4°. Zürich, 1891. (*Denkschr. schweiz. naturf. Gesellsch.*, xxxii., 2, 1891.)

‖ ——— Witterungs-Uebersicht des Jahres 1890 nebst Mittelwerten für das Decennium 1890–91. 8°. Basel, 1891. (*Verhandl. naturf. Gesellsch. Basel*, ix. *Theil.*, 2 *Heft*, *p.* 533.)

——— Zur Wolken-Photographie. 8°. Dated, Basel, 1891.

* **Rimbault, E. F.**—Old ballads illustrating the great frost of 1683–4 and the fair on the River Thames. Collected and edited by E. F. Rimbault. Printed for the Percy Society. No. xlii. sm. 8°. London, 1844.

Rio de Janeiro, Observatorio.—Esboço de uma climatologia do Brazil por **H. Morize.** la. 8°. Rio de Janeiro, 1891.

In the French language also.

Riposto, Osservatorio Meteorologico del R. Istituto Nautico.—Bollettino mensile. Anno xvii., 1891. Fasc. 1–12. sm. f°. Riposto, 1891.

Rome, Specola Vaticana.—Pubblicazioni. Fasc. i. sm. f°. Roma, 1891.

——— **Ufficio Centrale Meteorologico e Geodinamico Italiano.**—Annali. Serie ii. Vol. ix., 1887, Parte 1–5. 5 vols. sm. f°. Roma, 1889–91.

——— ——— Bollettino meteorico. Anno xiii., 1891, Jan. 1—Dec. 31. la. 4°. Sheets.

——— ——— Rivista Meteorico-Agraria. Anno xii., 1891, N. 1–36. la. 8°. (*Roma*, 1891–92.)

Rugby School Natural History Society.—Report . . . for the year 1891. 8°. Rugby, 1892.

* **Russell, Hon. R.**—The spread of influenza: its supposed relations to atmospheric conditions. 8°. London, 1891.

St. Petersburg, Kaiserliche Akademie der Wissenschaften.—Repertorium für Meteorologie. . . . Redigirt von **H. Wild.** Bd. xiv. sm. f°. St. Petersburg, 1891.

——— **Kaiserl. Russische Geographische Gesellschaft.**—Beobachtungen der Russischen Polarstation auf Nowaja Semlja. I. Theil. Magnetische Beobachtungen. Bearbeitet von **K. Andrejeff.** Herausgegeben unter redaction von **R. Lenz.** la. 4°. s.l., 1891.

In the Russian language also.

——— **Observatoire Physique Météorologique.**—Bulletin météorologique. 1891, Jan. 1—Dec. 31. f°. Sheets.

In the Russian language also.

——— **Physikalisches Central-Observatorium.**—Annalen . . . herausgegeben von **H. Wild.** Jahrg. 1890. Theil i. und ii. 2 vols. sm. f°. St. Petersburg, 1891.

San Fernando, Instituto y Observatorio de Marina.—Anales . . . Publicados . . . por el Director Don **C. Pujazon.** Seccion 2ª. Observaciones meteorológicas. 1890. f°. San Fernando, 1891.

——— ——— Boletin meteorologico. 1888, Jan. 1– June 29. sm. f°. Sheets.

? Discontinued.

‖ **Saussure, H.-B. de.**—Observations météorologiques faites au Col du Géant du 5 au 18 juillet 1788. Avant-propos par H. de Saussure. la. 4°. Genève, 1891. (*Mém. soc. phys. hist. nat. Genève. Vol. suppl.*, 1890, *No.* 9.)

Schaub, F.—Admiral Fitz Roy's Witterungsanzeigen und Sturmsignale. sm. 8°. (*Almanach österr. Kreigsmar., Wien*, 1864.)

Schreiber, P.—Anträge und Darlegungen zu den Fragen: 3, 6, 8, 25, 26, 27, 30, 48, 49, des provisorischen Programms vom 1 Juli 1891 für die Verhandlungen der Versammlung der Directoren der meteorologischen Centralstellen der Erde in München. la. 4°. s.l.e.a.

‖ ——— Untersuchung über die Periodicität des Niederschlages im Königreich Sachsen. sm. f°. (*Meteor. Zeitschr.*, 1891, *Dec.*, *p.* 441.)

‖ **Schück, A.**—Taifun im Süden der Meiaco sima Gruppe (N. W. Pacifik). 1865, Sept. 2–5–6. 8°. (*Verh. Ver. Naturw. Unterhaltung zu Hamburg*, vii., 1886–90.)

——— Zwei Taifune in der China-See, deren Zentrum nach einer südlich von West liegenden Richtung zog. 1870 Oct. 9–14 u. 1872 Sept. 10–14. 8°. (*Verh. Ver. Naturw. Unterhaltung zu Hamburg*, vii., 1886–90.)

Seeland, F.—Magnetische und meteorologische Beobachtungen zu Klagenfurt. Dec. 1890—Nov. 1891 and year. 8°. s.l.e.a.

Shortland, P. F.—Temperature of the sea at various depths, between Bombay and Aden. (1868.) By Capt. P. F. Shortland, H.M.S. "Hydra." sm. f°. Sheet.

Silva, J. A. da.—As chuvas em Lisboa. 4°. (*Mem. Acad. R. Sc. Lisboa*, 1ª *Cl.*, II., *Part* ii., 1861.)

——— Noticia dos trabalhos magneticos executados no observatorio meteorologico do Infante D. Luiz na escóla polytechnica. 4°. (*Mem. Acad. R. Sc. Lisboa*, 1ª *Cl.*, II., *Part* ii., 1861.)

Singapore, Principal Medical Officer, Straits Settlements.—Annual meteorological report, Straits Settlements, for the year 1890. sm. f°. s.l.e.a.

|| **Singer, K.**—Die Witterung in Süddeutschland 1861–1890. Kurze monatliche Uebersichten. la. 4°. München, 1891. (*Beob. meteor. Stat. K. Bayern*, xii., 1890.)

|| **Steen, A. S.**—Die Aenderungen des Luftdruckes während einer totalen Sonnenfinsterniss. la. 8°. (*Ann. Hydr. mar. Meteor.*, 1891, *Mai.*)

Stockholm, Académie Royale des Sciences de Suède.—Exploration internationale des régions polaires, 1882–1883. Observations faites au Cap Thordsen, Spitsberg, par l'Expédition Suédoise. Tome i. la. 4°. Stockholm, 1891.

Stockholm, Kongl. Svenska Vetenskaps-Akademie.—Meteorologiska Iakttagelser i Sverige utgifna af Kongl. Svenska Vetenskaps-Akademien, anställda och utarbetade under inseende af meteorologiska Central-Anstalten. Bd. xxviii. 2dra. ser., Bd. 14. 1886. la. 4°. Stockholm, 1891.

In the French language also.

——— **Meteorologiska Central-Anstalt.**—Månadsöfversigt af väderleken i Sverige till landtbrukets tjenst utgifven under meteorologiska Central-Anstaltens inseende af Dr. **H. E. Hamberg.** Årgång xi. 1891. f°. Stockholm, 1891.

Stonyhurst College Observatory.—Results of meteorological, magnetical, and solar observations. By the Rev. **W. Sidgreaves.** 1889–91. 3 vols. sm. 8°. Market Weighton, 1890–91 and Clitheroe, 1892.

The Appendix contains "Results of meteor. obsns. taken at St. Ignatius' College, Malta, by the Rev. J. Scoles. 1889, 1890, 1891."

|| **Strachey, R., and Whipple, G. M.**—Cloud photography conducted under the Meteorological Council at the Kew Observatory. 8°. (*Proc. R. Soc.*, xlix., 1891, *p.* 467.)

Stuttgart, Königl. statistisches Landesamt.—Mitteilungen. iii. Jahrg., 1891, Nos. 1–12. la. 8°. Stuttgart, s.a.

Contains "Witterungsübersicht . . . nach den Beob. der württemb. meteor. Stationen."

——— **Meteorologische Centralstation.**—Deutsches meteorologisches Jahrbuch. Jahrg. 1890. Meteorologische Beobachtungen in Württemberg. Mitteilungen der mit dem Königlichen statistischen Landesamt verbundenen meteorologischen Centralstation. Bearbeitet von **L. Meyer.** la. 4°. Stuttgart, 1892.

Sundell, A. F.—Åskvädren i Finland 1890. 8°. Helsingfors, 1891.

Sydney Observatory.—Abstract of meteorological observations made in New South Wales, during the years 1865 and 1866: under the direction of **G. R. Smalley.** la. 8°. Sydney, 1869.

——— ——— Meteorological observations made at the Government Observatory, Sydney, . . . under the direction of **G. R. Smalley** and **H. C. Russell.** Jan. 1867—Dec. 1877. la. 8°. Sydney, 1867–79.

From Jan. 1871 the title has the addition—"And an abstract from the country stations."

[——— ———] Meteorological observations at Sydney. 1890, Jan.—Dec. 8°. s.l.e.a.

——— ——— Weather maps. July 1, 1880—Mar. 31, 1888. 8 vols., sm. 4°. s.l.e.a.

——— ——— Weather chart of Australia and New Zealand. 1890, Jan. 1—Dec. 31. f°. Sheets.

——— **Royal Society of New South Wales.**—Journal and Proceedings. Vol. xxiv. 8°. Sydney, s.a.

Symons, G. J.—British rainfall, 1890. On the distribution of rain over the British Isles, during the year 1890 . . . 8°. London, 1891.

Symons's Monthly Meteorological Magazine.—Vol. xxvi., 1891. 8°. London, 1892.

Syracuse, Osservatorio Centrale di Siracusa.—Osservazioni meteorologiche fatte nell' osservatorio centrale di Siracusa e nelle stazioni della rete meteorico-agraria della provincia. Anno xv., 1891, Jan.—Dec. 8°. Siracusa, 1891.

Tacubaya, Observatorio Astronómico Nacional.—Anuario. 1892. Año xii. Formado bajo la dirección del Ingeniero **A. Anguiano.** sm. 8°. México, 1891.

Tananarive, Observatoire Royal de Madagascar.—Observations météorologiques faites à Tananarive par **E. Colin.** Vol. ii. 1890. 8°. Tananarive, 1891.

Tarry, H.—Bulletin de météorologie dynamique pour l'étude des grands mouvements de l'atmosphère. Nos. 2–3. Avril 12 et 16, 1873. 2 sheets, 4°. Paris, 1873.

——— Observations des pluies de sable. 4°. Dated, Paris, 1873.

* **Taylor, A.**—A comparative enquiry as to the preventive and curative influence of the climate of Pau and of Montpellier, Hyères, Nice, Rome, Pisa, Florence, Naples, Biarritz, etc., on health and disease, with a description of the watering places of the Pyrenees and of the virtues of their respective mineral sources. A new edition, considerably altered and enlarged. 8°. London, 1856.

Tebbutt, J.—Report of Mr. Tebbutt's Observatory, the Peninsula, Windsor, New South Wales, for the year 1890. 8°. Sydney, 1891.

——— Results of meteorological observations made at the private observatory of John Tebbutt, the Peninsula, Windsor, N. S. Wales, in the years 1886–90. sm. f°. Sydney, 1891.

——— The Sydney Observatory and the "Sydney Morning Herald." A plea for astronomy in New South Wales. 8°. Sydney, 1891.

* || **Thornton, B.**—The comparative climatology of London and the chief English health resorts. sm. 8°. London, 1891. (*Lancet, Sept.* 20, 1890.)

Tiflis, Physikalisches Observatorium.—Beobachtungen der Temperatur des Erdbodens. 1884, 1885. 2 vols. la. 8°. Tiflis, 1886, 1891.
In the Russian language also.

1884 has a Supplement: Beobachtungen am Radiations-Thermometer in den Jahren 1881–1884.

——— ——— Magnetische Beobachtungen. 1890. la. 8°. Tiflis, 1891.
In the Russian language also.

——— ——— Meteorologische Beobachtungen. 1890. la. 8°. Tiflis, 1891.
In the Russian language also.

* || **Tillo, A. de.**—Répartition géographique de la pression atmosphérique sur le territoire de l'Empire de Russie et sur le Continent Asiatique d'après les observations depuis 1836 jusqu'à 1885. Avec atlas de 69 Cartes. la. 8°. (St. Petersburg), 1890. [*Mem. Imp. Russian Geogr. Soc.*, xxi.]

Todd, C.—Artificial rain-production. The Government Astronomer interviewed. Newspaper cutting. (*Adelaide Evening Journal*, 1891, *Nov.* 30.)

——— The past summer. (1890–91.) Newspaper cutting. (*Adelaide Advertiser*, 1891, *Apl.* 29.)

Tokio, Imperial Meteorological Observatory.—Report of the meteorological observations in the Empire of Japan. 1886–1891. 6 vols. la. 8°. s.l.e.a.
In the Japanese language also.

——— **Meteorological Central Observatory.**—Annual meteorological report. 1888, Part ii.; 1889, Parts i. and ii.; 1890, Parts i. and ii. 5 vols. la. 8°. s.l.e.a.
In the Japanese language also.

——— ——— Cautionary signals. f°. Dated, January, 1892.

——— ——— Tri-daily weather maps, reports, remarks, and indications. 1890–91, Jan.—Dec. 4°.
In the Japanese language also.

Tonga.—Statistics of the Tonga Islands for the year ended 31st December, 1889. sm. f°. Suva, 1891.
Contains met. obsns. for 1890

Toronto, Magnetical Observatory.—General meteorological register for the year 1890. 8°. s.l.e.a.

——— **Meteorological Service, Dominion of Canada.**—Monthly weather review. 1891, Jan.—Dec. la. 4°. s.l.e.a.

——— ——— ——— Report. By C. Carpmael. 1887. la. 8°. Ottawa, 1890.

Trieste, I. R. Accademia di Commercio e Nautica.—Osservazioni meteorologiche instituite all' Osservatorio Marittimo. 1891, Jan.—Dec., and Results. oblong la. 8°. Sheets.

——— **Osservatorio Marittimo.**—Rapporto annuale . . . contenente le osservazioni meteorologiche e mareografiche di Trieste . . . per l'annos 1888, 1889. Redatto da **F. Osnaghi** e da **E. Mazelle.** Vol. v.–vi. 2 vols. la. 4°. Trieste, 1891–92.

Trinidad, Royal Botanic Gardens.—Annual report. 1889-90. 2 vols. f°. l.e.a. and Port-of-Spain, 1891.

——— ——— Meteorological results . . . . for the year 1890. f°. s.l.e.a.

——— ——— Meteorological Returns. 1891, Jan.—Dec. sm. f°. Sheets.

Tucuman, Oficina Quimica.—Boletin. Tomo i. 1888. 8°. Tucuman, 1888.

‖ **Turin Osservatorio della R. Università.**—Osservazioni meteorologiche . . . . . 1890 . . . . . calcolate dal G. B. Rizzo. la. 8°. Torino, 1891. (*Atti R. Accad. Sc. Torino*, xxvi., 1891.)

——— **Società Meteorologica Italiana.**—Annuario meteorologico italiano. Anno vii. 1892. sm. 8°. Torino, 1892.

——— ——— Il XXV. Anniversario. 8°. Torino, 1891.

——— ——— Bollettino mensuale pubblicato per cura dell' Osservatorio centrale del Real Collegio Carlo Alberto in Moncalieri. Serie ii., vol. xi. (della intera Collezione vol. xxvi.) 1891. sm. f°. Torino, 1891.

Tyrer, R.—The meteorology of Cheltenham. Abstract of meteorological observations taken at the Modern School, Cheltenham, during 1891. la. f°. Sheet.

‖ **Unterweger J.**—Über die kleinen Perioden der Sonnenflecken und ihre Beziehung zu einigen periodischen Erscheinungen der Erde. la. 4°. Wien, 1891. (*Denkschr. math.-naturw. Cl. k. Akad. Wissensch.*, lviii.)

Upsala, Observatoire Météorologique de l'Université.—Bulletin mensuel. Par **H. H. Hildebrandsson.** xxii., 1890. la. 4°. Upsal, 1890-91.

Utrecht, Koninklijk Nederlandsch Meteorologisch Instituut.—Nederlandsch meteorologisch Jaarboek. 1890. oblong 8°. Utrecht, 1891.

——— ——— Routen voor Stoomschepen tusschen Aden en Nederlandsch Oost-Indie. oblong la. 8°. Utrecht, 1891.

In the French language also.

‖ **Veeder, M. A.**—The zodiacal light. la. 8°. Rochester, N.Y., 1891. (*Proc. Roch. Acad. Sc.*, i., *p.* 137.)

Vienna, K. K. Central-Anstalt für Meteorologie und Erdmagnetismus.—Beobachtungen. 1891, Jan.—Dec., and Results. 8°.

——— ——— Jahrbücher. 1889. Neue Folge xxvi. Bd. la. 4°. Wien, 1890.

——— ——— Telegrafischer Wetterbericht. Jahrg. xv., 1891. Jan. 1—Dec. 31. la. 4°. Sheets.

——— **Kais. Königl. geographische Gesellschaft.**—Mittheilungen. 1890. xxxiii. Bd. (der neuen Folge xxiii.) la. 8°. Wien, 1890.

Vilafranca del Panadés, Observatorio Meteorológico.—Observaciones efectuadas durante el año 1891 . . . . Publicadas por el Director **J. Balta de Cela.** la. 8°. Vilafranca, 1892.

‖ **Vincent, J.**—Cirro-stratus et alto-stratus. 4°. (*Mém. cour. et mém. sav. trang., acad. R. sc. &c. Belgique.*, lii., 1891.)

‖ ——— Contrôle des abris thermométriques de l'observatoire d'Uccle. la. 4°. [? Ann. Obs. R. Bruxelles.]

Völcker, K.—Untersuchungen über das Intervall zwischen der Blüthe und Fruchtreife von "Aesculus Hippocastanum" und "Lonicera tartarica." 8°. Giessen, 1891.

* **Washington.**—Correspondence respecting the International Marine Conference, held at Washington, 1888-89. sm. f°. London, s.a.

(——— **Department of Agriculture.**)—Report of the Commissioner of Agriculture. 1888. la. 8°. Washington, 1889.

Continued as—

——— ——— Report of the Secretary of Agriculture. 1889, 1890. 2 vols. la. 8°. Washington, 1889-90.

——— ——— **Weather Bureau.**—Special report of Chief of the Weather Bureau to the Secretary of Agriculture, 1891. 8°. Washington, 1891.

——— **Hydrographic Office.**—Pilot charts of the North Atlantic Ocean. 1891, Jan.—Dec. and supplements. Charts. la. f°.

——— **Signal Office.**—Annual report. 1890. 8°. Washington, 1890.

Washington, Signal Office.—Bibliography of meteorology: A classed catalogue of the printed literature of meteorology from the origin of printing to the close of 1881; with a supplement to the close of 1889, and an author index. Prepared under the direction of **A. W. Greely.** Edited by **O. L. Fassig.** Part iv. Storms. 4°. Washington, 1891.

——— ——— Charts showing the average monthly cloudiness in the United States. la. f°. Dated, Washington, 1891.

——— ——— Charts showing average velocity and direction of the wind, prepared from observations for seventeen years. la. f°. Dated, Washington, 1891.

——— ——— Charts showing the isobars, isotherms, and winds in the United States for each month from January, 1871, to December, 1873. la. 4°. Washington, 1891.

——— ——— Charts showing the probability of rainy days prepared from observations for eighteen years. la. f°. Dated, Washington, 1891.

* ——— ——— History of the Signal Service, Army of the United States, and special catalogue of the U.S. Signal Service exhibit at the International Exhibition of Electricity. la. 8°. Paris, 1881.

——— ——— International monthly charts of mean pressures and wind directions at 7 a.m. Washington mean time, for 1882 and 1883. la. f°. s.l.e.a.

——— ——— Mean temperatures and their corrections in the United States. By **A. McAdie.** la. 4°. Washington, 1891.

——— ——— Monthly Weather review. 1891, Jan.—Dec. and Suppl. 4°. Washington, 1891-92.

——— ——— Normal temperature charts by decades for the United States and the Dominion of Canada. la. f°. Washington, 1891.

——— ——— War Department weather map. 1891, Jan. 1—Dec. 31. la. f°. Sheets.

‖ ——— **United States Naval Observatory.**—Magnetic observations at the United States Naval Observatory, 1888 and 1889, by **J. A. Hoogewerff.** 4°. Washington, 1890. (*Washington Obsns., 1886, App.* 1.)

* **Weather Gossip.** la. 8°. (*Chambers's Journ.*, viii., 1891, *p.* 497.)

Weihrauch, K.—Meteorologische Beobachtungen angestellt in Dorpat in den Jahren, 1881–85. xvi.—xx. Jahrg., iv. Bd. la. 8°. Dorpat, 1891.

For continuation see WEIHRAUCH, K., UND OETTINGEN, A. VON.

——— **und Oettingen, A. von.**—Meteorologische Beobachtungen angestellt in Dorpat in der Jahren 1886–1890. xxi.-xxv. Jahrg., v. Bd. la. 8°. Dorpat, 1892.

* **Weir, Captain.**—Azimuth diagram. la. f°. London, 1890.

Wellington, Meteorological Department.—Return of rainfall, in inches, for each month of the year, at the four principal stations in New Zealand, from January 1881, to August 1891, with diagrams. f°. Wellington, 1891.

‖ ——— **Meteorological Office.**—[Meteorological observations in New Zealand.] 1890. sm. f°. (*Statist. New Zealand*, 1890, *p.* 80.)

Wetter, Das.—Meteorologische Monatschrift für Gebildete aller Stände. Herausgegeben von **R. Assmann.** viii. Jahrg., 1891. la. 8°. Braunschweig, 1891.

Wetzel, C.—Jahres-Supplement zur Davoser Wetterkarte für das Jahr. 1886 la. f°. Sheet.

See also DAVOS.

‖ **Whipple, G. M., and Dines, W. H.**—Report of the wind force Committee on experiments with anemometers conducted at Hersham. Drawn up by G. M. Whipple and W. H. Dines. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xiv., 1888, *p.* 253.)

Whymper, E.—How to use the aneroid barometer. 8°. London, 1891.

‖ **Wigert, T.**—Trombe de Wimmerby le 4 Juillet, 1890. Note communiquée le 12 Nov. 1890. 8°. Stockholm, 1891. (*K. Svenska Vet.-Akad. Handl., Bd.* xvi.)

Wild, H.—Mittheilungen der internationalen Polar-Commission. Redigirt von H. Wild, herausgegeben auf Kosten der Kaiserlichen Academie der Wissenschaften in St. Petersburg. sm. f°. St. Petersburg, s.a.

In the French and English languages also.

‖ ——— Nadel-Inclinatorium modificirter Construction. sm. f°. St. Pétersbourg, 1890. (*Mém. Acad. Imp. Sc. St. Pétersb.*, vii^e *sér.*, xxxvii., *No.* 6.)

|| **Wild, H.**—Über den Einfluss der Aufstellung auf die Angaben der Thermometer zur Bestimmung der Lufttemperatur. sm. f°. St. Petersburg, 1891. (*Repert. Meteor.*, xiv., *No.* 9.)

Wiltshire Rainfall.—1890–91. 2 vols. oblong 8°. Marlborough, 1891–92.

|| **Wollny, E.**—Untersuchungen über das Verhalten der atmosphärischen Niederschläge zur Pflanze und zum Boden. No. 4. Die Durchfeuchtung des Bodens seitens der atmosphärischen Niederschläge. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg*, xiv., *Heft* 1, 2.)

|| ——— Untersuchungen über die Permeabilität des Bodens für Wasser. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg*, xiv., *Heft* 1. u 2.)

* **Wormell, R.**—Plotting, or graphic mathematics. sm. 8°. London, s.a.

Yale Observatory.—Report for the year 1890–91, presented by the Board of Managers of the Observatory of Yale University to the President and Fellows. la. 8°. s.l.e.a.

York, Yorkshire Philosophical Society.—Annual Report . . . . for 1890. la. 8°. York, 1891.

* **Zeitschrift für wissenschaftliche Geographie** unter Mitberücksichtigung des höheren geographischen Unterrichts. Herausgegeben von **J. I. Kettler.** Bd. viii. la. 8°. Weimar, 1891.

Zi-ka-wei, Observatoire Magnétique et Météorologique. — Bulletin mensuel. Tome xvi., année 1890. sm. f°. Zi-ka-wei, 1891.

Zürich, Schweiz. Departement des Innern.—Graphische Darstellung der schweizerischen hydrometrischen Beobachtungen. 1891. la. f°. Sheets.

For the second half of the year the title is in French.

——— ——— Tabellarische Zusammenstellung der Haupt-Ergebnisse für 1887, 1888. f°. Bern, s.a.

In the French language also.

——— **Schweizerische Meteorologische Central-Anstalt.** — Annalen. 1889. Der "Schweiz. meteor. Beob." xxvi. Jahr. 4°. Zürich, s.a.

——— ——— Wetterbericht. 1891, Jan. 1—Dec. 31. sm. f°. Sheets.

APPENDIX XVI.

Account of Receipts and Payments for the year ending 31st March 1892.

Receipts.	£ s. d.	£ s. d.	Payments.	£ s. d.	£ s. d.
Balance from year 1890–91		3,101 1 2	Administration:		
Parliamentary Vote		15,300 0 0	Payment of Council	992 10 0	
Repayment of expenses charged under—			Secretary	800 0 0	
(1.) Incidental expenses	12 14 6		Salaries and wages	793 6 0	
(2.) Expenses incidental to International Meteorological Congress	18 10 0		Rent, fuel, and lighting	702 11 2	
(3.) Observatories	10 14 10		Incidental and contingent expenses:—		
		41 19 4	Attendance, cleaning, &c.	389 11 9	
Supply of Information:			Furniture and fittings	201 13 11	
D.W. Charts and Forecasts	247 13 11		Expenses incidental to International Meteorological Congress	33 2 9	
6 p.m. Charts	25 0 0		Pensions	186 16 4	
Information for Press Agencies, &c.	121 13 11				4,099 11 11
Telegrams	61 10 2		Special Researches		904 5 2
		455 18 0	Land Meteorology:		
Sale of Instruments, &c.:			Observatories and stations	3,645 11 2	
Royal Navy (A)	25 12 3		Salaries: —Discussion and reduction of observations	1,271 4 0	
Mercantile Marine account (B)	40 5 4				4,916 15 2
M.O. account	46 0 2		Weather Information and Forecasts:		
		111 17 9	Telegraphic reports and storm warnings	2,600 19 1	
Commissions executed for Colonial and Foreign Institutions, &c. (C)		199 15 6	Salaries: — Preparation and issue of reports and forecasts	1,825 12 1	
Commission charged on work done for Colonies, &c.		18 4 11			4,426 11 2
			Inspections:		
			Salaries and travelling expenses		584 0 11
			Ocean Meteorology:		
			Salaries:—Discussion and reduction of observations	1,670 12 0	
			Expenses incidental to the supply of instruments:—		
			Proportion for care and issue of instruments	200 0 0	
			Royal Navy	254 11 5	
			Mercantile Marine	223 13 8	
			Distant island and coast stations	26 12 11	
					2,375 10 0
			Commissions executed for Colonial and Foreign Institutions, &c.		218 14 6
			Balance:		
			Cash at Bank	1,613 14 9	
			„ at Office	89 13 1	
					1,703 7 10
	£	19,228 16 8		£	19,228 16 8

In the year 1891–92 the sum of 1,527*l.* 6*s.* 1*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, and rental of private wires.

APPENDIX XVII.

LIST OF PUBLICATIONS, &c. issued under the Authority of the Meteorological Council.

OFFICIAL.

No. 1. Report of the Meteorological Committee for 1867. 1*s.*
2. Instructions for Meteorological Telegraphy. New Edition, 1891. Prepared for the use of observers exclusively.
3. Fishery Barometer Manual. (New edition, 1887.) 6*d.*
4. Charts showing the Surface Temperature of the South Atlantic Ocean in each Month of the Year. 2*s.* 6*d.*
5. Report of the Meteorological Committee for 1868. 5*d.*
6. Report of the Meteorological Committee for 1869. 10*d.*
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5*s.* each.
8. Barometer Manual. (Out of print. See Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5*s.* each.
10. Report of the Meteorological Committee for 1870. 10*d.*
11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2*s.* 6*d.*
12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2*s.* 6*d.*
13. A Discussion of the Meteorology of that Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. With Book of Charts, 5*s.*
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s.* each.
15. Report of the Meteorological Committee for 1871. 10*d.*
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5*s.* each.
17. Report of the Meteorological Committee for 1872. 1*s.*
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2*s.*
19. Quarterly Weather Report for 1873.—Parts I. to IV. 5*s.* each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20° — 30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20*s.*
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1873. 1*s.*
22. Report of the Meteorological Committee for 1873. 4*d.*
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2*s.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 24. Instructions in the Use of Meteorological Instruments. [Reprinted 1892.] 2*s.* 6*d.*

25. Quarterly Weather Report for 1874.—Parts I., II., and IV., 5*s.* each. Part III., 5*s.* 9*d.*

26. Report of the Meteorological Committee for 1874. 6*d.*

27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. 24*s.*

28. Contribution to the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger.* 1*s.*

29. Report of the Meteorological Committee for 1875. 4*d.*

30. Quarterly Weather Report for 1875.—Parts I.—IV. 5*s.* each.

31. Report of the Meteorological Committee for 1876–7. 3*s.* 5*d.*

32. The Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. With Book of Charts. 15*s.*

33. Quarterly Weather Report for 1876 (New Series).—Part I., 6*s.*; Parts II., III., and IV., 5*s.* each.

34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Vol. I.: Part I., 2*s.*; Part II., 10*s.*; Part III., 6*s.*; Part IV., 5*s.*; Part V., 6*s.*

35. Report of the Meteorological Council for 1877–8. 1*s.*

36. Report of the Proceedings of the Second International Meteorological Congress at Rome, 1879. 1*s.* 6*d.*

37. Report on the Meteorology of Kerguelen Island. By Rev. S. J. Perry, S.J., F.R.S. 3*s.*

38. Report of the Meteorological Council for 1878–9. 5*d.*

39. Meteorological Observations at Stations of the Second Order for the year 1878. 20*s.*

40. Aids to the Study and Forecast of Weather, by W. Clement Ley, M.A. 1*s.*

41. Report of the Meteorological Council for 1879–80. 1*s.*

42. Report of the Meteorological Council for 1880–81. 1*s.* 2*d.*

43. Meteorological Charts for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Charts, 25*s.*; Remarks, 7*s.*

44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E., by Capt. H. Toynbee, F.R.A.S. 7*s.* 6*d.*

45. Meteorological Observations at Stations of the Second Order for the year 1879. 20*s.*

46. Report on the Storm of October 13–14, 1881. By Robert H. Scott, F.R.S. 1*s.* 6*d.*

47. Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. 7*s.* 6*d.*

48. Report of the Meteorological Council for 1881–2. 1*s.*

49. Quarterly Weather Report for 1879. (New Series.) Parts I., II., and III., 6*s.* each; Part IV., 5*s.* 6*d.* Appendices and Plates. 27*s.*

50. Quarterly Weather Report for 1880. (New Series.) Parts I. and II., 6*s.* each; Part III., 4*s.*; Part IV., 6*s.* Appendices and Plates. 28*s.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 51.* Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1881. (New Series.) Part I., 10*s.* 6*d.* Parts II., III., and IV., 21*s.* each.

52. Quarterly Weather Report for 1877. (New Series.) Part I., 10*s.*; Part II., 5*s.*; Part III., 4*s.* 6*d.*; Part IV., 6*s.* Appendices and Plates. 27*s.*

53. Meteorological Atlas of the British Isles. 5*s.* 6*d.*

54. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1882. Parts I. and II., 20*s.* each; Part III., 22*s.* 6*d.*; Part IV., 26*s.*

55. Quarterly Weather Report for 1878. (New Series.) Parts I., II., III., and IV., 6*s.* each. Appendices and Plates. 28*s.*

56. Sunshine Records of the United Kingdom for 1881. 4*s.*

57. Meteorological Observations at Stations of the Second Order for the year 1880. 34*s.* 6*d.*

58. Report of the Meteorological Council for 1882–3. 10½*d.*

59. Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. 21*s.*

60. Principles of Forecasting by means of Weather Charts. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition, revised.) 2*s.*

61. A Barometer Manual for the Use of Seamen. 1*s.* 3*d.*

62. Monthly Weather Reports for 1884. Jan., Feb., March, May —Nov., 1*s.* 6*d.* each. April (with 2 Appendices), 2*s.* 6*d.* Dec., 1*s.* 9*d.*

63. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1883. Parts I., II., and III., 21*s.* each; Part IV., 30*s.*

64. Report of the Meteorological Council for 1883–4. 1*s.* 2*d.*

65. Monthly Weather Reports for 1885. Jan. to Dec., 1*s.* 6*d.* each.

66. Meteorological Observations at Stations of the Second Order for the year 1881. 35*s.*

67. Report of the Meteorological Council for 1884–5. 4*s.* 4*d.*

68. Monthly Weather Reports for 1886. Jan. to Dec., 1*s.* 6*d.* each.

69. Meteorological Observations at Stations of the Second Order for the year 1882. 35*s.*

70. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1884. Part I., 12*s.*; Part II., 10*s.*; Part III., 10*s.* 6*d.*; Part IV., 15*s.*

71. Synchronous Weather Charts of the North Atlantic and the adjacent Continents. Aug. 1, 1882, to Sept. 3, 1883. Parts I. to IV. (33 sheets each.) 17*s.* each.

72. Report of the Meteorological Council for 1885–86. 8*d.*

73. Meteorological Observations at Stations of the Second Order for the year 1883. 30*s.*

74. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1885. Parts I. and II., 11*s.* each; Part III., 10*s.* 6*d.*; Part IV., 12*s.*

* For the years 1874–1880 the Hourly Readings were issued in lithographed form. Price 20*s.* per annum.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 75. Report of the Meteorological Council for 1886–87. 8*d.*
76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10*s.* 6*d.* Supplementary Chart, 6*d.*
77. Monthly Weather Reports for 1887. January to April, 1*s.* 6*d.* each. May to December, in wrapper, 12*s.*
78. Meteorological Observations at Stations of the Second Order for the year 1884. 32*s.*
79. Report of the Meteorological Council for 1887–88. 1*s.*
80. Daily Weather Charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. 10*s.*
81. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1886. Parts I., II., and III., 10*s.* 6*d.* each. Part IV., 12*s.* 6*d.*
82. Meteorological Observations at Stations of the Second Order for the year 1885. 31*s.*
83. Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and the Army Medical Department. 1852–1886. 23*s.*
84. Report of the Meteorological Council for 1888–89. 5½*d.*
*85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4*d.* per week. With Appendices and Monthly Supplements, priced separately.
86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.
87. Weekly Weather Report for the year 1890. Vol. VII. Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.
88. Meteorological Observations at Stations of the Second Order for the year 1886. 25*s.*
89. Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo. 1886–88. By the late W. Reid, M.D. 8*s.* 6*d.*
90. Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. 7*s.*
91. Report of the Meteorological Council for 1889–90. 7½*d.*
92. Meteorological Charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras Hafún. 6*s.*
93. Harmonic Analysis of Hourly Observations of Air Temperature and of Pressure at British Observatories. 12*s.*
94. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1887. 16*s.*
95. Meteorological Observations at Stations of the Second Order for the year 1887. 24*s.*
96. Weekly Weather Report for the year 1891. Vol. VIII., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual subscription, including Supplements and Appendices, post paid, 30*s.*

* The publication of the Weekly Weather Report began in February 1878. Annual subscription, 1878–1883, 12*s.* 6*d.*; 1884–1887, 21*s.* 2*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 97. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1888. 20*s.*

98. Ten Years Sunshine in the British Isles, 1881–90. 2*s.*

99. Report of the Meteorological Council for 1890–91. 5½*d.*

100. Weekly Weather Report for the year 1892, Vol. IX., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, Post paid, 30*s.*

101. Meteorological Observations at Stations of the Second Order for the year 1883. (In the Press.)

102. Report of the International Meteorological Conference at Munich in 1891. (In the Press.)

103. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1889. 15*s.*

104. Report of the Meteorological Council for 1891–92.

NON-OFFICIAL.

No. 1. Report of an Inquiry into the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6*d.*

2. Report to the Committee of the Meteorological Office on the Meteorology of the North Atlantic.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

3. Report to the Committee of the Meteorological Office on the Use of Isobaric Curves.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6*d.*

5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6*d.*

6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1872. 1*s.*

7. Notes on the Form of Cyclones in the Southern Indian Ocean.—By C. Meldrum, M.A., F.R.S. [Out of Print.]

8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 1873. 6*d.*

9. Report of the Permanent Committee of the First International Meteorological Congress at Vienna for 1874. 1*s.* 6*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 10. On the Physical Geography of the part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875.—By Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s.* 6*d.*

11. Report of the Permanent Committee of the First International Congress at Vienna for 1876. With Supplement. 2*s.*

12. Reports to the Permanent Committee of the First International Meteorological Congress at Vienna on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s.*

13. Report of the Permanent Committee of the First International Congress at Vienna for 1878. 6*d.*

14. Report of the International Meteorological Committee. Meeting at Berne, 1880. 1*s.*

15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. 2*s.* 6*d.*

16. Report of the Third Meeting of the International Meteorological Committee, held at Paris, September 1885. 1*s.*

17. Report of the Fourth Meeting of the International Meteorological Committee, held at Zürich, September 1888. 4*d.*

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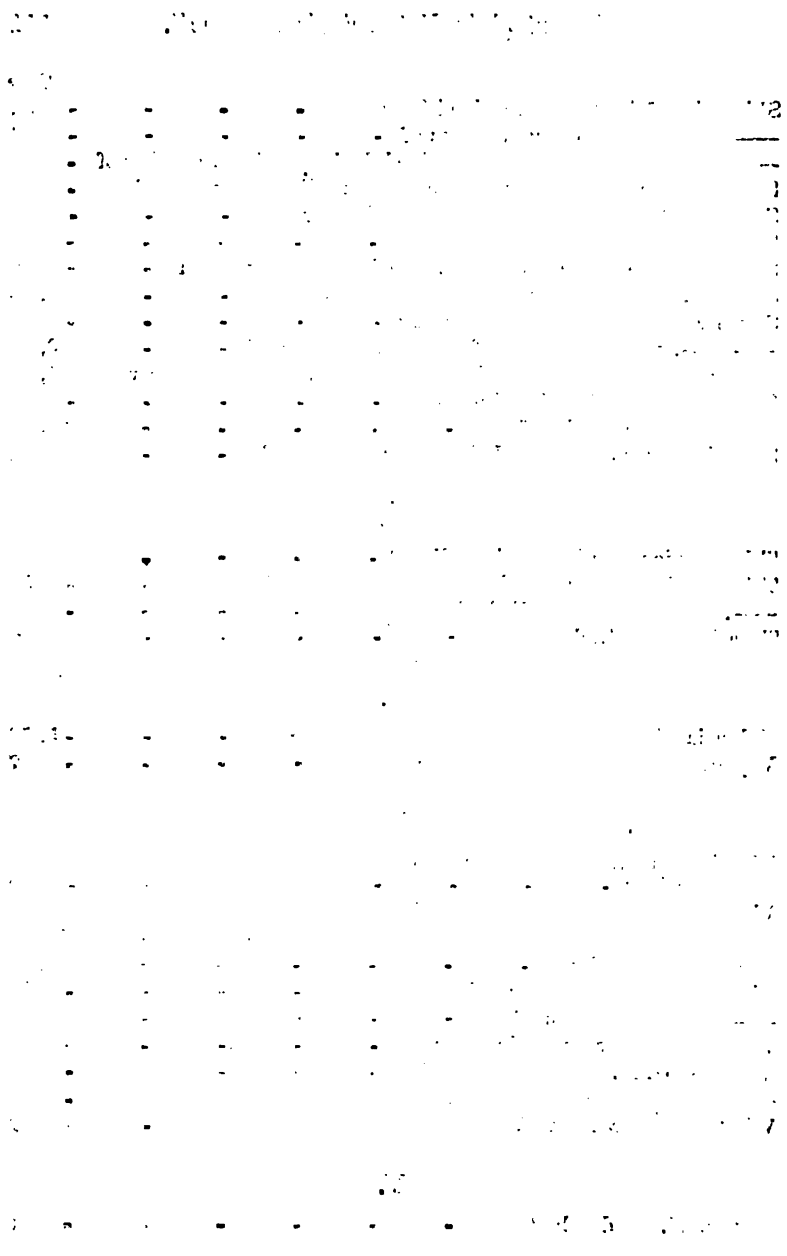

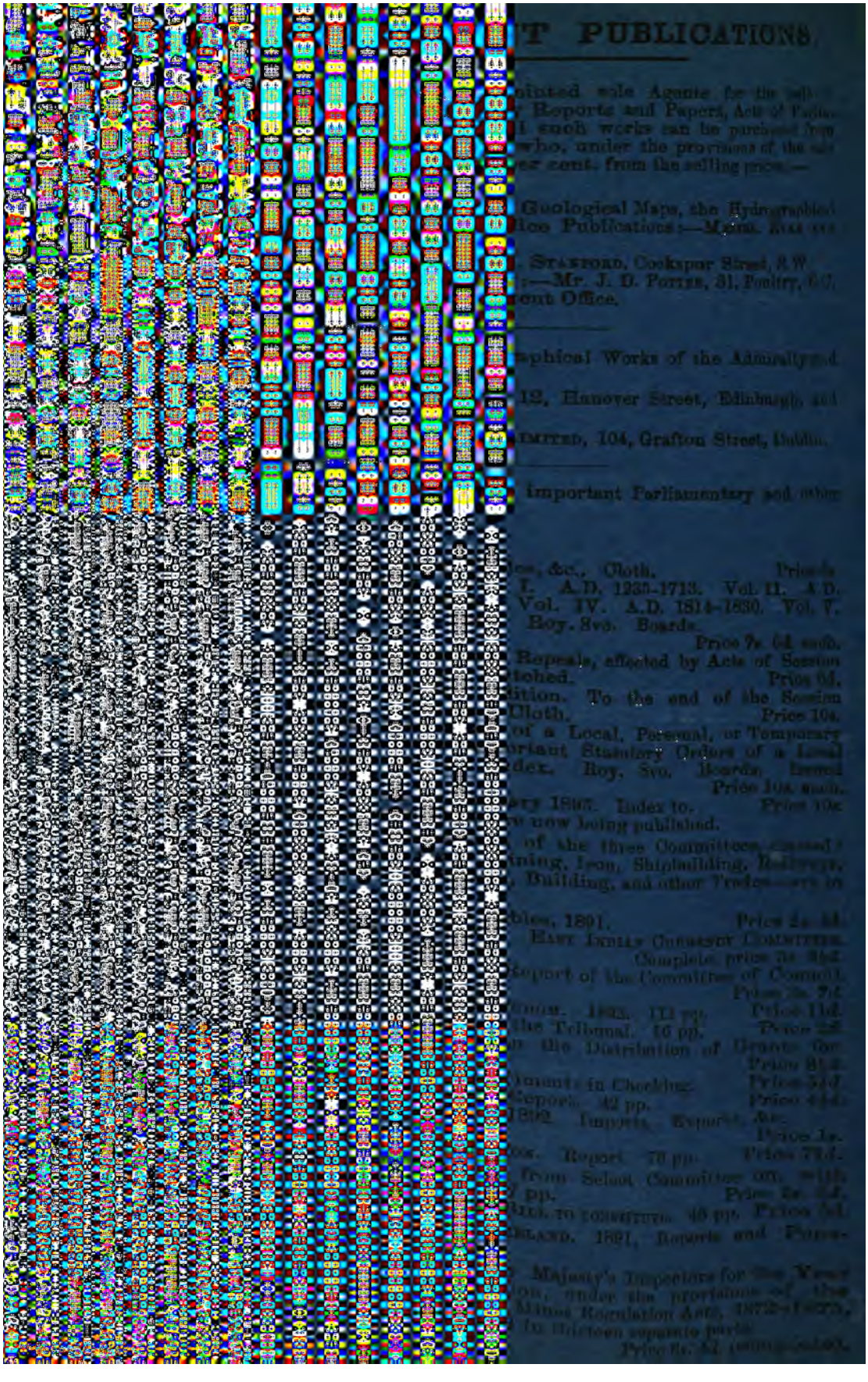

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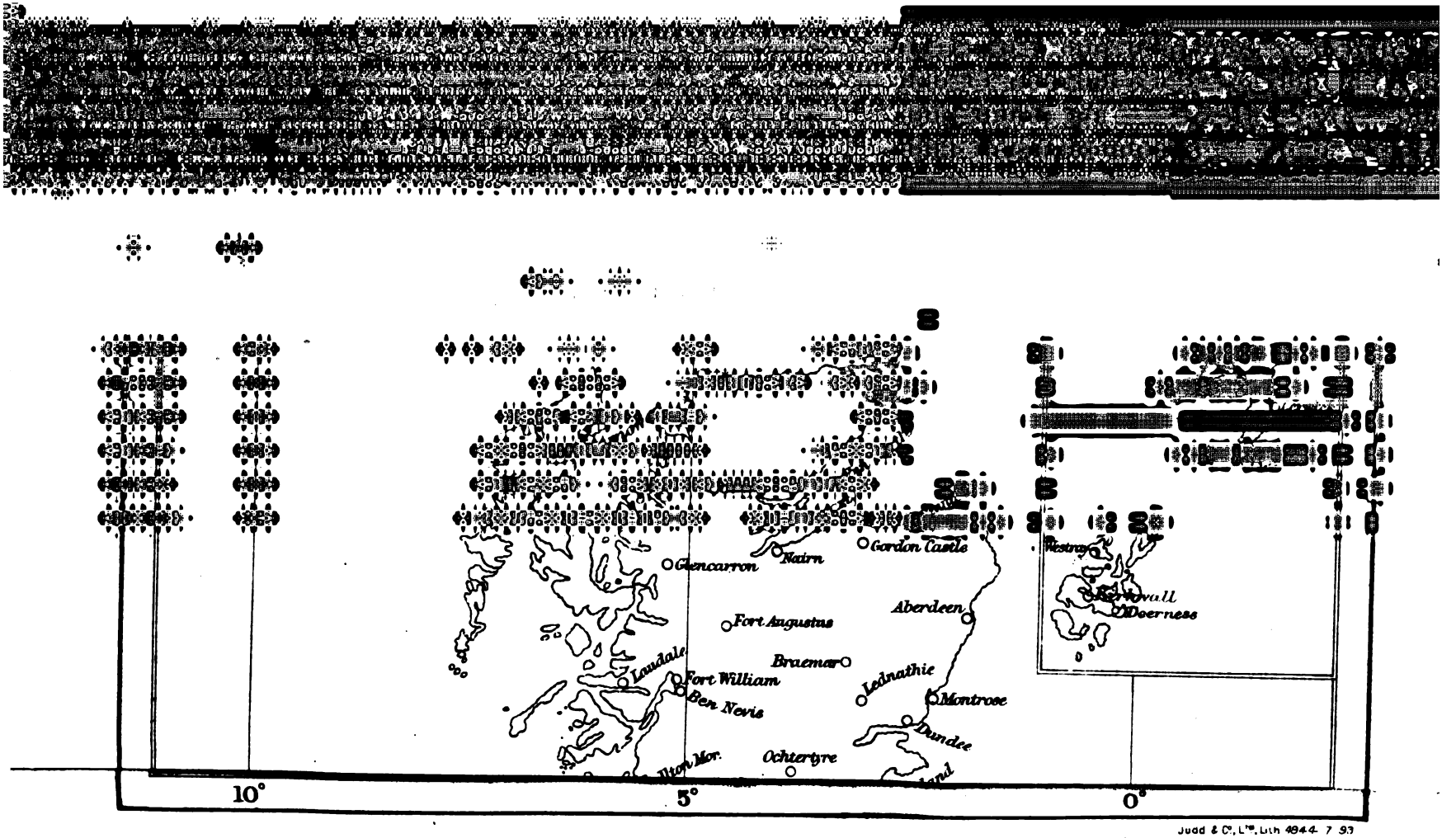

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See Appendices Nos V, VII, XI, XIII & XIV.

REPORT

OF THE

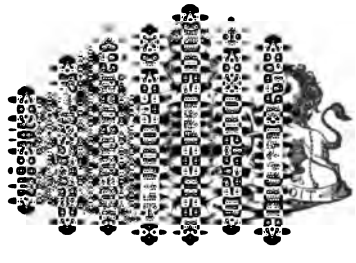
COMMITTEE OF COUNCIL

ON

EDUCATION,

1892-93.

Presented to both Houses of Parliament by Command of Her Majesty.



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THE METEOROLOGICAL COUNCIL,

1892–93.

Lieutenant-General RICHARD STRACHEY, R.E., C.S.I., LL.D., F.R.S., Chairman.

MR. ALEXANDER BUCHAN, M.A., LL.D., F.R.S.E.

Professor GEORGE HOWARD DARWIN, M.A., LL.D., F.R.S.

MR. FRANCIS GALTON, M.A., F.R.S.

MR. EDWARD J. STONE, M.A., F.R.S.

Captain WILLIAM J. L. WHARTON, R.N., F.R.S., Hydrographer of the Admiralty.

REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1893.

Introductory.

THERE has been no change in the Council during the year. The executive officers are, as stated in the last Report:—

Mr. R. H. Scott, M.A., F.R.S., Secretary.
Nav.-Lieut. C. W. Baillie, R.N., F.R.A.S., Marine Superintendent.

The Report is, as usual, divided into four sections or parts:

I. OCEAN METEOROLOGY.
II. WEATHER TELEGRAPHY.
III. LAND METEOROLOGY.
IV. MISCELLANEOUS.

PART I.

OCEAN METEOROLOGY.

Collection of information.

Collection of Information.—The practice followed by the Office with reference to observers at sea, as described in former Reports, remains unchanged.

Recognition of "excellent" observers.

Appendix I. (p. 35) contains a list of all the observers who during the past year have contributed logs classed as "excellent." Several of these observers have regularly co-operated with the Office for many years. The names which appear in the list for the first time are as follow:—

Captain's Name.	Ship.
Armstrong, B. G. - - -	S.S. "Para."
Barclay, J. - - - -	S.S. "Thermopylæ."
Hand, G. E., Lt. R.N. - -	H.M.S. "Egeria."
Jamieson, D. E. - - -	S.S. "Port Adelaide."
Tait, H. - - - -	S.S. "India."
Tyson, J. - - - -	S.S. "Arab."

Proportion of "excellent" to total number of logs received.

The total number of Meteorological logs received in the year ending March 31, 1893, was 122, of which 91, or 74 per cent., have been classed as "excellent."

The average number of logs received annually during the five years, 1887–91, was 173, of which the per-centage of "excellent" logs was 75.

The Council have also received, through the Ocean Steamship Company of Liverpool, a considerable number of ships logs, mostly from voyages to and from the China Seas, *viâ* Suez.

The Council take this opportunity of expressing their best thanks to the observers who have assisted them during the past year.

They regret to have to announce the deaths of two of their observers. They were Captains E. Ashdown and A. Campbell.

Appendix II. (p. 37) gives a list of the meteorological logs and of meteorological reports from stations abroad, received at the Office during the year.

Districts from which observations are obtained.

The following summary of the voyages of the ships observing for the Office shows the districts from which observations were received during the year:—

To Baffin's Bay or Greenland - - - -	2
„ North America, East Coast - - -	14
„ „ „ West „ - - - -	7
Off East Coast of North America - - -	2
To West Indies - - - - -	5
„ South America, East Coast - - - -	11
„ „ „ West „ - - - -	4
„ Australia and New Zealand, viâ Cape of Good Hope	27
„ „ „ viâ Suez - -	6
At Australian stations - - - - -	1
To India, viâ Suez - - - - -	4
„ India, viâ Cape of Good Hope - - -	13
„ China, viâ Suez - - - - -	1
In China Seas - - - - - -	6
To Cape of Good Hope - - - -	11
Off East Coast of Africa - - - -	2
To West Coast of Africa - - - -	1
Between British Ports - - - - -	3
To Continental Ports - - - - -	4

Red Sea Charts.—These charts have been completed, and they are now in the hands of the engraver.

Current Charts for the Atlantic, Pacific, and Indian Oceans.— Great additions have been made to these charts during the past year. 750 Royal Navy logs have been dealt with, making a total of about 6,000 received from the Public Record Office for the period prior to the introduction of the uniform system of Remark Books on board Her Majesty's ships, and dating back to the year 1830. It was not thought desirable to obtain observations from the logs of an earlier date, owing to probable errors arising from the use of imperfect instruments. About 9,000 observations were supplied by the French Government; about 13,600 by Dr. Neumayer, of Hamburg; 3,500 by Baron van Heerdt of Utrecht; 550 observations from the Austrian Navy, and a few from the Russian Navy. In addition to these, valuable data have been obtained from the logs of various steamship companies which were courteously placed at the disposal of the Council. Nearly the whole of the observations collected from the foreign sources are for the Pacific Ocean, where, as compared with the Atlantic and Indian Oceans, observations are very scarce. In fact, for the central part of the Pacific Ocean scarcely any data exist. Current Charts.

Southern Ocean.—Cape of Good Hope to New Zealand. All available data for this district have been dealt with, and the monthly charts representing wind, barometrical pressure, air, and sea-surface temperature, fog, and currents, are now being drawn. In the wind charts, the new form of wind rose, shown in last year's report, page 7, is being adopted, as in the case of the Red Sea Charts.

Future Marine Work.—The Council have decided that the next district to be discussed shall be the South Atlantic, including the portions of the Pacific adjacent to the South American coast, extending in longitude from 90° W. to 20° E., and in latitude from the Equator as far south as observations are available. This inquiry will be carried out in a similar manner to that for the Cape to New Zealand district.

Arctic Currents.—A copy of the monthly current charts of the Arctic regions, have been supplied to Dr. Nansen for his contemplated Arctic expedition.

Supply of Instruments to distant Stations.—The instruments for St. Helena, as mentioned in last Report, have safely reached that island. The Council have entered into correspondence with Lloyd's with the view of organizing observing stations at some of their agencies in the Pacific islands. Applications have been received for the supply of instruments to Papeete, Tahiti, and Rarotonga, Cook's Islands, and the necessary outfits will be forwarded. The Council have also supplied instruments to a new station recently established by Lloyd's at Cape Spartel, Morocco. Distant stations.

Supply and Stock of Instruments.—In Appendix III. (p. 43) is given a list of the meteorological instruments supplied by the Office to ships in the Royal Navy during the year, with a statement for the 31st March 1893 of the stock and distribution Stock of Instruments belonging to the Office.

Stock of instruments belonging to the Office.

of the instruments standing on the books to the account of the Admiralty.

Appendix IV. (p. 44) gives similar information with regard to the disposal of the other instruments belonging to the Office, remaining in store, or which have been supplied to the Mercantile Marine, and to observatories, telegraph stations, &c.

PART II.

Weather Telegraphy and Forecasts.

Administrative.

There have been no serious interruptions of telegraphic communication during the year, excepting that the cable to the Shetlands broke down in February, and communication was interrupted for a fortnight.

The Council have to regret the death on the 21st of February of their observer, at Mullaghmore, Mr. Kenneth Kerr, who had acted in that capacity for more than 14 years, since October 1878. Inasmuch as in 1884 the telegraph was extended through the county Mayo to Belmullet, a point about 100 miles to the westward of Mullaghmore, where a telegraphic reporting station has been established, the necessity for keeping up the latter station did not seem to the Council sufficiently great to justify the cost of the private wire connecting Mullaghmore with the Post Office telegraphs, and the station is therefore to be abandoned on April 1, 1893.

Among the observers the changes have been the substitution at Bidston observatory of Mr. Plummer for Mr. Hartnup, whose death was noticed in the last Report, at Cambridge of Mr. P. Morris for Mr. H. Todd, at Leith of Mr. Richardson for Mr. Newlands, and at Parsonstown of Mr. Perry for Mr. Haines.

Daily and Weekly Weather Reports.

A list of the telegraphic reporting stations, British and Foreign, is given in Appendix V. (p. 45).

The work in this branch of the Office continues to increase. The Daily and Weekly Weather Reports, in particular, have been extended and improved.

Inspection of the Stations.

Inspection of the Telegraphic Reporting Stations.—The telegraphic reporting stations have been inspected during the year, in England by Mr. Ley, in Scotland by Mr. Buchan, and in Ireland and Wales by Mr. Scott. The reports submitted by the Inspectors to the Council, which are printed in Appendix VI. (p. 46), show that the efficiency of the service continues to be satisfactorily maintained.

Discussion of the reports.

Discussion and Publication of the Information received.—The practice of the Office in collecting, discussing, and disseminating the meteorological information received by telegraph is described in Appendix VII. (p. 60). The Daily Weather Report has appeared regularly during the year; for details see that Appendix. It is distributed free of cost as follows:—To newspapers,

seven copies; to seaports, for public exhibition, 71 copies; to Government offices and public institutions, 66 copies; to correspondents of the Office, 73 copies; and to foreign meteorological establishments, 46 copies. Nearly 200 copies are issued regularly to subscribers. Distribution of reports.

The Weekly Weather Report, with its Monthly Appendices, has also appeared regularly; for particulars of this publication see Appendix VII. (p. 60).

Public display at the Office of the State of the Weather on British Coasts.—This arrangement, which was made with a view to the earliest possible supply to the public of the latest information as to the weather received from the principal points on the eastern, southern, and western coasts, has been regularly carried out, and it is believed with general public approval. It supplies at 9.30 a.m. and 3 p.m. every week day the substance of the reports received by telegraph, of the state of the weather and sea at the following stations: Yarmouth, Dungeness, the Needles (Hurst Castle), Scilly, Holyhead, and Valencia, and this is displayed in a conspicuous manner on the front of the Office, 63, Victoria Street, S.W. Display of information in front of the Office.

Supply of Forecasts to the Fleet.—At the request of the Admiralty daily forecasts were supplied to the Commander-in-Chief of the "A" Fleet during the continuance of the Manœuvres as in previous years, and also to the Commander-in-Chief, Devonport. This latter service is continued throughout the year. It commenced at the end of 1890. Forecasts for the Fleet.

Weather Forecasts.—Forecasts are prepared three times a day, namely, at 11 a.m., at 3.30 p.m., and 8.30 p.m. The Forecasts prepared at 11 a.m., on the information derived from the 8 a.m. reports, refer to the probable weather between noon on the day of issue and noon on the following day. They are publicly exhibited in several places in London,* and are supplied to the afternoon editions of the newspapers. The 3.30 p.m. Forecasts are employed for storm warnings only, excepting in the hay harvest season, when they are issued as subsequently explained. The forecasts at 8.30 p.m. are specially prepared for publication in the morning newspapers, but all the forecasts are available for the information of anyone who applies for them at the Office. Forecasts.

The inquiries received through the Post Office for special forecasts during the year amounted to 92, and the personal applications to 44. The rules of the Office relating to such inquiries are stated in Appendix VII., p. 64. Inquiries at the Office.

* Viz., in the City at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's, Cornhill, and Messrs. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and the House of Commons, at Messrs. Elliot's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and Messrs. Pastorelli's, New Bond Street; and at the Office, 63, Victoria Street.

Results of Forecasts.

The results of a comparison of the Forecasts issued at 8.30 p.m. during the year, with the weather actually experienced, are given in Appendix VIII. (p. 65). The following summary shows the successes and failures over the whole United Kingdom, estimated as explained in that Appendix.

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1892–93.

Districts.	Per-centages.				Total per-centage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	45	36	13	6	81
„ E. - -	47	31	16	6	78
ENGLAND, N.E. - -	49	32	15	4	81
„ E. - -	47	34	15	4	81
MIDLAND COUNTIES -	47	31	16	6	78
ENGLAND, S. - -	48	35	14	3	83
SCOTLAND, W. - -	41	32	17	10	73
ENGLAND, N.W. -	43	34	14	9	77
„ S.W. -	49	31	12	8	80
IRELAND, N. - -	46	32	13	9	78
„ S. - -	41	34	15	10	75
Summary - -	46	33	14	7	79

* Note "partial" implies "more than half."

Testing of Forecasts.

The following table shows for each year from 1883 to 1892, inclusive, the per-centages of complete and partial success of the Forecasts issued at 8.30 p.m. for the whole year.

PER-CENTAGES of RESULTS of FORECASTS for the whole of the BRITISH ISLES.

Year.	Complete Success.	Partial, *i.e.*, more than Half Success.	Total Success.
1883 - -	48	33	81
1884 - -	50	31	81
1885 - -	50	34	84
1886 - -	49	31	80
1887 - -	52	32	84
1888 - -	51	31	82
1889 - -	49	32	81
1890 - -	50	32	82
1891 - -	50	30	80
1892 - -	46	33	79
Average -	49	32	81

Hay Harvest Forecasts.—The Council renewed in 1892 the offer made in previous years to the Royal Agricultural Society, the Royal Dublin Society, and the Highland and Agricultural Society to send Daily Forecasts *gratis* during the haymaking season to a number of observers selected by those Societies, on two conditions, viz., that the information should be made known as widely as possible, and a record of the weather actually experienced sent weekly to the Office. The Societies accepted the proposal, and the Forecasts were issued as shown in the following table:— Hay Harvest Forecasts.

LIST of those who received HAY HARVEST FORECASTS in 1892.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass	Golspie.
	Major Smith	Munlochy, Inverness.
1. SCOTLAND, E.	J. Whitton	Glamis Castle, by Forfar.
	G. Murdoch	Rothiemay, Huntly.
	C. W. L. Forbes	Aberfeldy.
2. ENGLAND, N.E.	Sir J. Wilson	Chillingham Barns, Chatton, Northumberland.
	J. Turner	The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck	High House, Thorpe, Norwich.
	Sir J. B. Lawes, Bt., and Sir J. H. Gilbert, Ph.D.	Rothamsted, Harpenden.
4. MIDLAND COUNTIES	Royal Agricultural College.	Cirencester.
	E. E. Harcourt-Vernon	Grove Hall, East Retford.
5. ENGLAND, S.	C. Whitehead	Barming House, Maidstone.
	E. P. Squarey	The Moot, Downton, Wilts.
	The Aylesbury Dairy Company.	Stammerham, Horsham.
	M. J. Sutton	Kidmore Grange, Caversham.
6. SCOTLAND, W.	W. Calder	Castle Hill, Dalreoch, Dumbarton.
	Sir M. J. Stewart, Bt., M.P.	Ardwell, Stranraer.
	J. S. R. Ballingal	Eallabus House, Islay.
7. ENGLAND, N.W.	G. W. Wray	Leyburn, Yorkshire.
	The Earl of Derby, K.G.	Knowsley Hall, Prescot.
8. ENGLAND, S.W.	The Earl of Ducie	Tortworth, Gloucestershire.
	T. Dyke	Long Ashton, Clifton, Bristol.
	R. Neville Grenville	Butleigh Court, Glastonbury.
9. IRELAND, N.	E. F. Farrell	Moynalty, Co. Meath.
	J. M. Wilson, J.P.	Currygrane, Edgeworthstown.
10. IRELAND, S.	D. A. Milward	Lavistown, Kilkenny.
	W. Talbot Crosbie, D.L.	Ardfert Abbey, Tralee, Co. Kerry.
	The Earl of Rosse, K.P.	Birr Castle, Parsonstown.

Hay Harvest Forecasts.

In addition to the above names the forecasts were sent to six other gentlemen at their own cost.

The issue commenced over the Southern districts of England on the 13th June, and ended 16th July; but commenced and ended about a fortnight later in the more Western and Northern parts of the country.

The general result of the issue of these forecasts, shown by the subjoined table, has been prepared solely from the reports of the above-mentioned gentlemen, and is entirely independent of any estimate formed within the Office itself:—

SUMMARY of RESULTS.—HAY HARVEST FORECASTS, 1892.

Districts.	Names of Stations.	Per-centages.				Total per-centage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N. -	Munlochy and Golspie - - -	61	28	11	—	89
„ E. -	Aberfeldy, Glamis, and Rothiemay -	58	20	16	6	78
ENGLAND, N.E. -	Chatton and Ulceby - - -	46	35	14	5	81
„ E. -	Rothamsted and Thorpe - -	50	32	15	3	82
MIDLAND COUNTIES	Cirencester and East Retford - -	44	38	15	3	82
ENGLAND, S. - -	Reading, Maidstone, Downton, and Horsham.	61	30	8	1	91
SCOTLAND, W. -	Stranraer, Islay, and Dumbarton -	63	29	5	3	92
ENGLAND, N.W. -	Leyburn and Prescot - - -	61	35	4	—	96
„ S.W. -	Tortworth, Clifton, and Glastonbury -	60	33	7	—	93
IRELAND, N. - -	Moynalty and Edgeworthstown -	58	30	9	3	88
„ S. - -	Tralee, Kilkenny, and Parsonstown -	56	38	6	—	94
	Mean for all districts - -	56	32	10	2	88

These figures show that the results for the forecasts for 1892 reached a total per-centage of success of 88, being one lower than was recorded in the three preceding years.

The Council have again been in communication with the Board of Agriculture on the subject of these forecasts.

Storm Warnings.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix IX., p. 67, are given the names of the stations furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade, issued in February 1874.

These stations were, at the end of March 1893, 173 in number, situated:—

83 in England, 17 in Wales, 47 in Scotland, 20 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

A comparison has been made in the Office between the warnings issued during the year and the weather experienced on our coasts,

ned in Appendix Storm Warnings.
re shown in the

between the
ENCED in 1892.

Storms for which no Warning was issued.
Jan. 29, 30, March 16, April 22, Oct. 7.
Feb. 1.
Oct. 7.
March 16, Oct. 7.
Feb. 15, Aug. 14–15.
Aug. 30, Oct. 29.
Jan. 7.
Dec. 9.
Jan. 29–30, Feb. 1, Oct. 23, Dec. 17.

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Storm Warnings.

April 22nd.—W. to N.W. gale in Scotland N.E. due to a large depression in the far north. Apparently caused by *rise* of barometer in far west—in rear of the disturbance.

August 14th to *15th.*—Southerly to Westerly gale over Irish Sea prevailed round a very small depression, which at 6 p.m., 14th, was not at all of a threatening character, and by 8 a.m., 15th, had disappeared entirely.

October 7th.—Northerly and North-Westerly gales on our north and north-west coasts. The depression which caused this gale moved northwards over the North Sea, while pressure simultaneously increased over our western districts; consequently the gale occurred, though not looked for.

October 29th.—South-South-Westerly gale over the British Channel. Very local, not felt either at Pembroke or Scilly.

Comparison of results for 1892 with previous years.

The following table contains a comparative statement of the storm warnings and their results in 1892, and in the ten preceding years. It will be seen that the total per-centage of warnings justified is 90·6, being the highest on record.

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
		p.c.	p.c.	p.c.	p.c.
1883	610	56·2	21·6	77·8	20·8
1884	461	66·4	20·0	86·4	12·1
1885	591	55·3	24·0	79·3	19·5
1886	542	55·3	26·9	82·2	15·9
1887	472	55·5	26·1	81·6	16·4
1888	539	55·3	28·6	83·9	14·3
1889	373	47·7	33·5	81·2	16·9
1890	525	61·0	25·5	86·5	9·3
1891	522	62·3	24·5	86·8	7·5
1892	488	59·4	31·2	90·6	6·8

Fishery Barometers.

Fishery Barometers.—To add to the means available to the sea-going population for obtaining warnings of stormy weather barometers were many years ago supplied by the Board of Trade on loan to fishing villages and other places on the coast, to be set up for public information. The whole number of stations supplied by the Office with these instruments is 192. Of these 62 are in England, 6 in Wales, 54 in Ireland, 65 in Scotland, 4 in the Isle of Man, and 1 in Jersey. The list is given in Appendix X., p. 69.

PART III.

Land Meteorology of the British Isles.

Observatories and Stations.—The observations of the climate of the British Isles, which are received by the Office from certain stations, may be arranged in five classes, according to the degree of completeness with which they are made.

Self-recording observatories.

1. Seven Observatories, furnished with self-registering instruments by which all the principal meteorological phenomena are recorded continuously. These alone afford the materials necessary for the study of the periodic variations of the meteorological elements.

Anemographic stations.

2. Nine Anemographic stations furnished with instruments registering the wind only. The records from these stations relate rather to weather as distinguished from climate, and are especially important in connexion with storms. They are often useful in affording evidence available in courts of law with respect to collisions at sea, and damage done by wind.

Stations of Second Order.

3. Seventy-four stations of the Second Order, furnishing climatological information from eye observations taken twice a day. The observers at these stations are all volunteers.

Telegraphic Reporting Stations.

4. Thirty-two Telegraphic Reporting Stations, at which the observations are taken by eye, but supplemented in some cases by self-recording aneroids, &c., and supply the material upon which the daily weather reports and forecasts are based. The hours of observation at these stations are determined by the requirements of the telegraphic system, as explained in Part II., but the data which they furnish are also utilized to afford climatological information for parts of the country where Stations of the Second Order do not exist.

Extra stations.

5. Extra stations furnishing returns with less completeness and detail than those of Class 3.

Sunshine stations.

A continuous record of the amount of bright sunshine is received from 51 stations in the British Isles, of which some are First or Second Order stations, whilst from others the sunshine record alone is received. See Appendix XI., p. 70.

A fuller account of these several stations and of the methods employed by the Office in dealing with their records will be found in Appendix XII., p. 72.

Documents received.

Appendix XIII., p. 75, contains a list of all documents relating to the land meteorology of the British Isles received at the Office during the year.

Death of Prof. Grant.

Death of Prof. Grant.—The Council have to mention their regret at the death of Prof. Robert Grant, F.R.S., which occurred on the 24th of October. Prof. Grant had, ever since 1868, been in charge of one of the seven observatories originally established by the Office. Glasgow was one of those which was not continued in operation at the charge of the Meteorological Office after 1884, but Prof. Grant by his own personal energy succeeded in obtaining from the local authorities at Glasgow funds sufficient to keep up the observations subsequently.

Inspection of stations.

Inspection of the Stations.—The self-recording observatories and the anemographic stations (Classes 1 and 2), as well as the Telegraphic Reporting Stations (Class 4), are regularly visited each year by the Inspectors of the Office. The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 3), some belong to the Royal Meteorological Society, and these are visited by an Inspector appointed by that Society,

Inspection of stations.

an allowance being made by the Office toward the cost of the inspection, in accordance with the recommendation of the Treasury Committee (1877). The remaining Stations of the Second Order, including those belonging to the Scottish Meteorological Society, are visited, most of them annually, by the Inspectors of the Office. The inspection of the self-recording observatories, which is carried out by the staff of Kew Observatory, was interrupted during the year by the protracted illness of Mr. Whipple, and was only partially carried out by Mr. T. W. Baker, whose time could not be spared from his duties at Kew. Mr. Baker went to Glasgow Observatory in April, and replaced some instruments which had been damaged.

Death of Mr. Whipple.

The death of Mr. Whipple, which occurred on the 8th of February, has been a very serious loss to the Council, for from his long experience of the work of the Kew Observatory he was eminently fitted to carry out his inspections efficiently, and otherwise to assist in the work of the Office in many important directions.

Extracts from the reports of the Inspectors are given in Appendix VI. p. 46.

Reports supplied to Registrar General for Ireland.

Information supplied to the General Register Office, Dublin.—Reports from the Irish stations of the Office have been regularly supplied to the Registrar General for Ireland, for his Weekly and Quarterly Returns.

Publications.

The Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office (see Appendix VII., p. 60), supplies, by its synchronous charts and Monthly Summaries, a very complete and instructive view of the chief meteorological changes, day by day, over the greater part of Europe, such as is not to be found in the similar publications issued by any other office.

Appendix I. to the Weekly Weather Report for 1892 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature for each district, for the 27 years 1866–1892, and also the Monthly and Progressive values of Accumulated Heat, Rainfall, and Bright Sunshine for all the districts in each month of 1892. Appendix II. to the same Report gives the Weekly and Progressive values for the same elements during the year 1892 (in continuation of Appendix II. for the year 1891).

Hourly Readings of Meteorological Observations.

Hourly Readings of Meteorological Instruments.—The Volumes of Hourly Means for 1889 and 1890 have appeared, and that for 1891 has been commenced. These volumes differ in no respect, as to arrangement, from that for the year 1887, described in the Report for 1890.

Harmonic Analysis of the Hourly Readings.

Harmonic Analysis of the Hourly Observations at British Observatories.—A discussion of the results obtained from the daily curves for temperature at the Observatories, which were published last year, has been laid before the Royal Society by Gen. R. Strachey, the Chairman, and an abstract of this communication is given as Note B., p. 27. The full paper appears in *Philosophical Transactions* for 1893.

Observations at Stations of the Second Order.—The volume for 1889 is now nearly complete. Stations for publication.

The following is the list of stations for which returns are being published for that year:—

STATIONS for PUBLICATION in DETAIL on Form A., 21 in Number.

Stations.	In connexion with	Years already published in detail.	Remarks.
Glasgow - -	M. O.	13	Formerly observatories. 10 years hourly readings already published. Continuous records of pressure, temperature, wind, and rainfall still available, except for Armagh, which furnishes such records for wind and rain only. For Stonyhurst and Armagh the records from 1884 have been published on Form A.
Stonyhurst -	M. O.	15	
Armagh - -	M. O.	15	
Dunrobin Castle -	S. Met. Soc.	9	
Braemar - -	S. Met. Soc.	9	High-level station (1,113 feet).
Dundee - -	S. Met. Soc.	9	
Wolfelee - -	S. Met. Soc.	3	
Scarborough -	R. Met. Soc.	8	
Hillington -	R. Met. Soc.	12	
Churchstoke -	R. Met. Soc.	13	
Carmarthen -	R. Met. Soc.	14	
Margate - -	R. Met. Soc.	7	
Babbacombe -	R. Met. Soc.	12	
Swanbister (Orkneys).	M. O.	3	This is the most northern station available, and there is a continuous record of wind.
Laudale - -	M. O.	10	
Douglas (Isle of Man).	M. O.	11	
Southampton -	M. O.	11	At both of these stations there are long series of observations available taken by the officers of the Ordnance Survey.
Dublin (Mountjoy Observatory).	M. O.	3	
Markree Castle -	M. O.	14	
Parsonstown -	M. O.	16	
Londonderry -	M. O.	10	

Stations for publication.

LIST for PUBLICATION on Form B. (Monthly Means and Summaries).

Swanbister.
S Lairg.
S Dunrobin Castle.
S Gordon Castle.
S Glencarron.
Aberdeen.
S Fort Augustus.
S Braemar.
S Fort William.
S Lednathie.
Laudale (Argyleshire).
S Dundee.
S Ochtertyre.
S Callton Mor.
Glasgow.
S Rosewell.
S Rothesay (Isle of Bute).
S Marchmont.
S Wolfelee.
S Pinmore (Ayrshire).
M Cramlington.
S Glenlee.
S Cargen.
Durham.
Newton Reigny.
Aysgarth (Yorkshire).
M Scarborough.
Cronkbourne (Douglas), Isle of Man.
York.
Stonyhurst.
M Wakefield.
Prestwich.
Liverpool (Bidston Observatory).
M Llandudno.
M Buxton.
M Cheadle.
M Hillington (Norfolk).
Uppingham.
M Churchstoke (Montgomeryshire).
Geldeston (Beccles).
M Bennington.
M Cheltenham.
St. David's.
M Carmarthen.
M Berkhamsted.
Kew.
M Margate.
Southampton (Ord. Survey Office).
Eastbourne.
M Rousdon.
M Dartmoor.
M Babbacombe (Torquay).
Falmouth.

Londonderry.
S Lissan (Co. Tyrone).
Armagh.
Brookeborough (Colebrooke Park)
Markree Castle (Co. Sligo).
Edgeworthstown.
Dublin (Glasnevin).
Dublin (Mountjoy Observatory, Phœnix Park).
Dublin (City).
Parsonstown (Birr Castle).
M Killarney.
Valencia.

The Stations marked S belong to the Scottish, and those marked M to the Royal Meteorological Society.

With reference to these stations and the arrangements with the Royal Meteorological Society and the Scottish Meteorological Society as to the supply of information therefrom, a considerable increase has been made in the allowances to the respective Societies, inasmuch as it was found that the terms hitherto existing were not sufficient to defray the cost of supply of the information.

PART IV.—MISCELLANEOUS.

Sea Surface Temperature.

Sea Surface Temperature on the Coasts of the British Isles.—These observations, which are obtained through the courteous assistance of the Admiral Superintendent of Naval Reserves, the Trinity House, and the Commissioners of Irish Lights, are still continued, and a large amount of valuable information is thereby collected.

A list of the stations at which the observations are taken will be found at Appendix XIV., p. 81.

Anemometer Experiments.

Anemometer Experiments.—The investigations on wind measurements which have been carried out for some time by Mr. W. H.

Dines, as mentioned in last Report, have for the present been concluded, and have resulted in the proposal of a new form of pressure gauge. One of these instruments has been constructed and erected on the roof of the Office in Victoria Street. A description of it will be found in Note A., p. 21. Anemometer Experiments.

A modification has been made in the bridled anemometer at Holyhead, used to record gales. It has been arranged that the pencil shall not commence to work unless the wind reaches a definite force, which can be fixed by the person in charge.

Seismometry.—An application was made to the Council in October by Prof. J. Ewing, F.R.S., to erect a seismometer at the Observatory at Fort William which is not very far distant from Comrie in Perthshire, a district frequently visited by slight shocks of earthquake. The Council at once granted permission for this interesting experiment. Seismometry.

Rain Means for the British Islands.—The Council have decided on publishing the means of Rainfall for the ten years 1881 to 1890, mainly from figures contributed by the Scottish Meteorological Society, and by Mr. G. J. Symons, F.R.S. It is intended that the distribution of the stations over the country shall be more uniform than was practicable in the former publication. The great and growing increase in the number of rain observers has rendered this course practicable. Rain Means.

Sunshine of the British Isles.—The Council have decided to undertake for the seven Observatories the regular tabulation of the hourly values of sunshine, from the year 1881, and the work is in hand. Sunshine.

Fog.—The examination of the weather reports for fog for the 15 years, 1875–1890, has now been completed by Mr. Scott, and the reports have been analysed and classified according to the force of wind reported. The results of the inquiry have been laid before the Royal Meteorological Society, and will shortly be published. Fog.

Library.

The library contains standard works on Meteorology and the allied Sciences, and is, besides, particularly rich in Transactions, Proceedings, Reports, and other Publications which give a large mass of Meteorological observational data from all parts of the world, extending over many years. It consists at present of about 12,000 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men for reference at the Office. Library.

Appendix XV., p. 83, contains a list of the additions to the library during the year, which have been catalogued upon cards, and are entered in the reference catalogues under (1) Authors, and (2) Subjects.

Expenditure.

Financial.

Appendix XVI., p. 105, shows the receipts and payments during the year ending 31st March 1893. The amount voted by Parliament was 15,300*l.*, as in the previous year.

The following abstract of expenditure shows the amount properly chargeable to the year in question, and its distribution under the various heads, together with the increase or decrease in 1892–93 as compared with the previous year :

Net Expenditure.	1891-92.	1892-93.	Increase.	Decrease.
General Administration:	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Payment of Council -	992 10 0	993 15 0	1 5 0	—
Secretary - -	800 0 0	800 0 0	—	—
Office - - -	793 6 0	793 0 0	—	0 6 0
Rent, fuel, and lighting -	700 11 3	720 18 2	20 6 11	—
Alterations to premises, attendance, and contingencies - -	553 10 3	476 10 1	—	77 0 2
Expenses incidental to International Meteorological Congress -	32 16 9	2 8 0	—	30 8 9
Pensions - - -	186 16 4	186 16 4	—	—
Special Researches -	905 1 8	882 13 2	—	22 8 6
Land Meteorology -	5,182 2 9	3,671 8 0	—	1,510 14 9
Weather Information -	3,823 6 0	3,847 8 6	24 2 6	—
Inspections - -	584 0 11	487 7 1	—	96 13 10
Ocean Meteorology -	2,351 5 0	2,360 6 0	9 1 0	—
Total - - £	16,905 6 11	15,222 10 4	54 15 5	1,737 12 0

In the year 1892–93 the sum of 1,551*l.* 2*s.* 11*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, and rental of private wires. The decrease under Land Meteorology is chiefly due to the outlay on Valencia Observatory in the preceding year.

(Signed) R. Strachey,
Chairman.

y MR. W. H. DINES).

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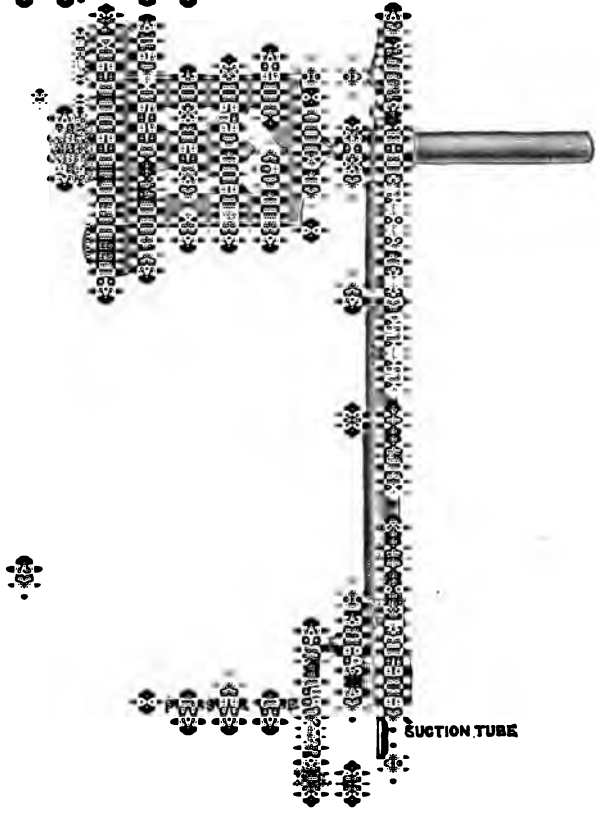

The moveable part of the head consists of two pieces of 1 in. tube connected at right angles, and a vane.

The horizontal tube is closed at one end, the other end (*A*) is kept facing the wind by the vane.

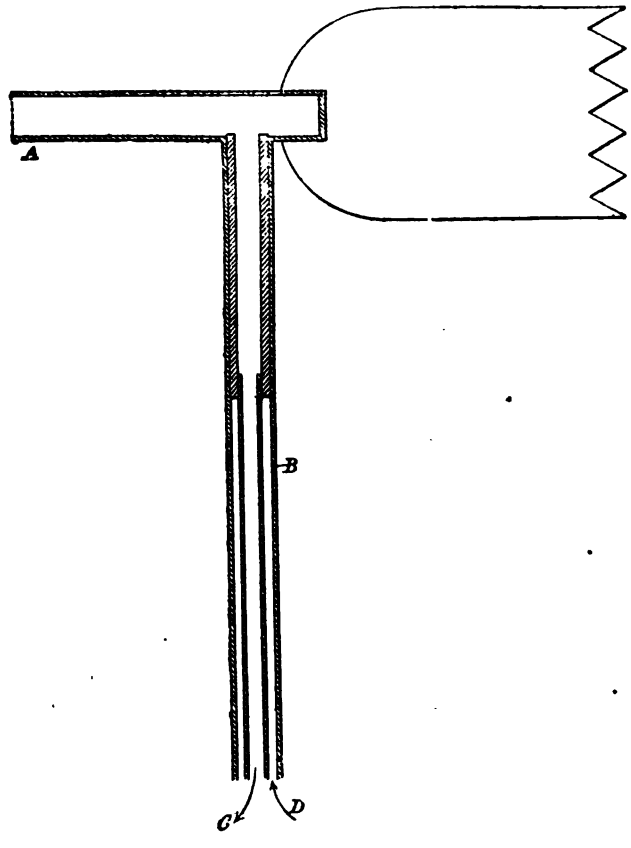

FIG. 2.—Head of Tube Anemometer in Section.

The fixed part is constructed out of three pieces of brass tube of consecutive sizes. The largest is $1\frac{1}{8}$ in. diameter, outside measurement. The medium size is of thicker metal than the others, and just fits into the largest size. The smallest piece is $\frac{3}{4}$-in. diameter, and just fits into the medium-sized tube. The two extremes are placed at the bottom, one inside the other, an annular space being thus formed between them. The medium-size tube drops into this annular space, thus closing it at the top, and is also carried up, thus forming a bearing round which the movable part turns. Near the top of the annular space (at *B*) 12 $\frac{1}{12}$-in. holes are drilled in the outer tube in a ring, by which holes the annular space is connected with the outer air.

The wind in passing over these holes exerts a small sucking action. At the same time, by blowing against the mouth, it causes an increase of pressure in the tube *A*. The whole result is a difference of pressure between the spaces (*C*) and (*D*), the following values of which have been found by direct trial on the whirling machine :—

	Ins. of Water.
At 10 miles per hour, difference of pressure -	= ·0731
„ 20 „ „ „ -	= ·2924
„ 30 „ „ „ -	= ·6579
„ 40 „ „ „ -	= 1·1696

and so on, the difference of pressure varying as the square of the velocity.

This particular form has been adopted for the following reasons. In experiments made upon the tube anemometer, on the large

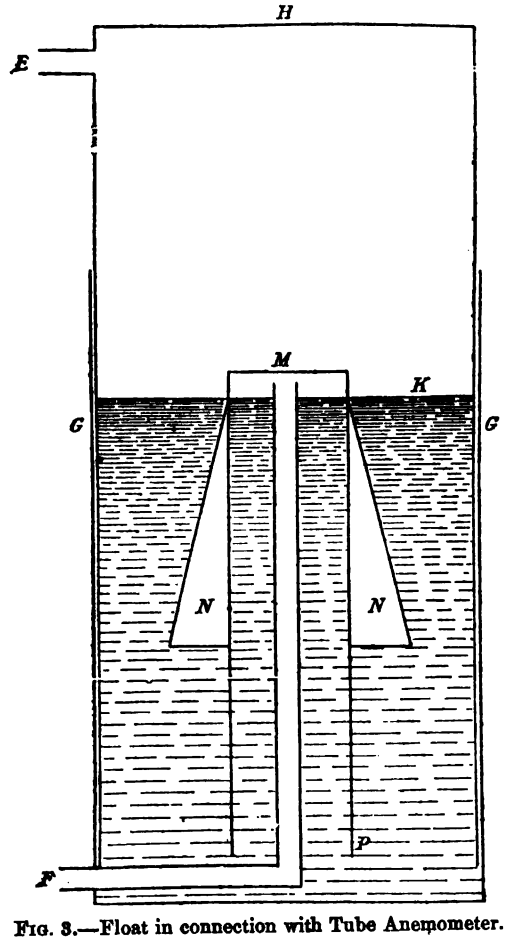

FIG. 3.—Float in connection with Tube Anemometer.

whirling machine at Hersham particulars of which will be found in the *Quarterly Journal of the Royal Meteorological Society,*

Vol. XVI., p. 208, 1890, it was found that the vacuum produced by the wind blowing over the mouth of an open tube was very dependent upon the exact perpendicularity of the tube, and if that kind of head had been used a slight inclination of the wind, which might easily be produced by some adjacent building, would have seriously influenced the result.

The partial vacuum, produced by the action of the air in passing over the ring of holes in the upright tube, has been found not to be subject to this objection. The pressure of the air blowing against the mouth of the open tube has also been found to be independent of the inclination of the wind direction to the axis of the tube, so long as the angle does not exceed 15° to 20°; hence the whole instrument, even if the vane did not act readily, would be independent of moderate changes of wind direction either in azimuth or inclination.

The way in which the change of pressure produced by the wind actuates the pen of the recording apparatus is shown in Fig. 3.

A cylinder (*G*) is filled with water up to the level *K*. A tube *F* passes up the centre, the mouth of the tube being about 1 in. above the surface of the water. A cylindrical copper vessel *M*, which will subsequently be called the float, is placed, mouth downwards, over this tube, so that the air space inside it can only communicate with the outer air through the tube *F*. On the outer side of the float a sealed air chamber *N* is formed, and a copper ring is attached to the bottom at *P*, of such a weight that the whole just floats with the top of the air chamber level with the surface of the water. A second cylinder *H* is placed mouth downwards in the outer cylinder *G*, fitting into it as closely as possible, and dipping below the surface of the water, forms a closed air space above the float. This space communicates with the outer air through the tube *E*. It will be seen that on either blowing into *F*, or sucking through *E*, the float will rise. It is also clear that if the float be raised by this means, the water level (*K*) outside the float is not disturbed, for the water which is driven or sucked from the inside exactly makes up for the smaller displacement of the float.

The tube *F* was connected with the inner tube *C* of the head (Fig. 5), and the tube *E* with the annular space *D*, the connexion being made in both cases by about 40 ft. of $\frac{3}{8}$-in lead tube.

The inside cross section of the float is 20 sq. ins., and hence it is found that a wind velocity of 10 miles per hour causes an upward force of 371 grains to act on the float; 20 miles per hour produces a force of 1,484 grains, and so on. The outer surface of the air chamber *N* is so shaped that the float must rise 1 in. to displace 371 grains less water; 2 in. to displace 1,484 gr. less water, and so on, and thus the ordinate of the curve is made to correspond to the velocity, instead of to the pressure, of the wind. The chamber *N* is not exactly conical, but bulges out slightly in the central parts. The float is connected with the pen by a rod passing through a small hole in the top of the cylinder *H*. The hole is so nearly filled up by the rod that, in so far as this instrument is concerned, it may be considered air tight.

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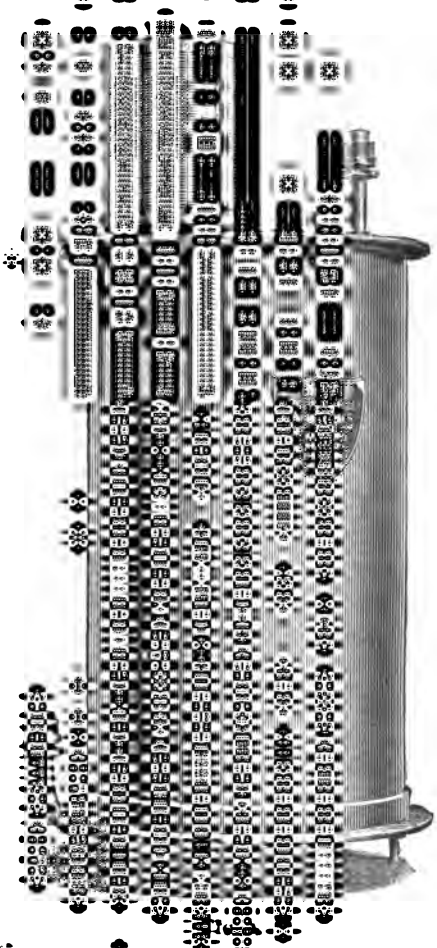

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open grate, making a good fire decreases the pressure by an appreciable amount. However, to test the point practically, the two tubes of the Anemometer were disconnected from the head and carried to two rooms on different sides of the house. The difference of pressure between the two rooms, acting upon the float of the recording apparatus, produced a curve which, had it been obtained in the ordinary way, would have indicated a mean velocity of about 12 to 15 miles per hour. The actual wind velocity, as shown by the Pressure Plate for the same period, was about 25 miles per hour. In this case care was taken to augment the difference of pressure between the rooms by suitably arranging the doors and windows; but it is clear that in the ordinary way great differences may exist, and if the instrument depended on one tube only, the indicated velocity would most probably be greater when placed in one room than it would be if placed in another.

NOTE B.

On the HARMONIC ANALYSIS of HOURLY OBSERVATIONS of AIR TEMPERATURES at BRITISH OBSERVATORIES.

By LIEUT.-GEN. R. STRACHEY, the Chairman.

A paper read by me before the Royal Society on the 2nd of March 1893, contained a discussion of the results of the computations of the harmonic constants of the daily curves of temperature at Greenwich and at the seven observatories maintained by the Meteorological Office, contained in the volume recently published by the Office, to which reference was made in the last Report of the Council, p. 17.

The tables supply the values of the coefficients of the cosines and sines of the several terms of the usual harmonic series, representing any hourly value :—

$$A_n = p_0 + p_1 \cos n\ 15^\circ + q_1 \sin n\ 15^\circ + \&c. \quad . \quad . \quad . \quad (1).$$

They also give the amplitudes of the several components, and the epoch of maximum derived from the formula

$$A_n = p_0 + P_1 \sin (n\ 15^\circ + T_1) + P_2 \sin n\ (2\ n\ 15^\circ + T_2), \&c. \quad (2).$$

A modification of the usual notation is made by introducing the value of the epoch of the first maximum that occurs after midnight, which is designated by the letter μ, and establishes more directly the connexion of the component with the hour of the day and the sun's place.

This system of analysis supplies the means of establishing an exact comparison between the characteristics of unsymmetrical curves, such as those that represent the hourly values of temperature, by resolving them into symmetrical components, having periods of 24 hours, 12 hours, 8 hours, 6 hours, and so forth; and its application to the records dealt with in these tables gives satisfactory proof of the important light it brings to bear on the nature and extent of the periodical changes of the diurnal temperature.

1. *Greenwich Temperature.*

The examination of the tables shows that, with very considerable variations of absolute magnitude, there is on the whole very marked consistency in the main characteristics of the components.

Taking as a test the position of the epoch of maximum, which may be regarded as more directly dependent on the sun's action and his position than the amplitude, it will be seen that the values of μ indicate very clearly the closeness of this connexion.

In all the components a truly periodical annual variation of the value of μ is apparent, and the period of maxmum always travels

backwards, that is, it becomes earlier as the year passes from winter to summer, while it returns in the opposite direction in the change back to winter.

For the first component the variation of the five-years' mean of μ from the twenty years is in no month more than $2\frac{1}{2}°$, or ten minutes of time, and the average for all months is less than half that amount.

In the second component the variation of the five-year mean of μ from the twenty-year mean is in no month more than 6°, and the average is only $2°\cdot3$, or nine minutes of time.

In the winter months the epoch of maximum of the third component is always between 4 a.m. and 5 a.m.; in March it changes rapidly, and in the summer is found invariably between midnight and 1 a.m., while after September it returns to its winter position. The variation of the five-year from the twenty-year mean of the values of μ in no month exceeds 5°, and the average in all months is only $2°\cdot1$, or $8\frac{1}{2}$ minutes of time.

The fourth component shows double maxima and minima, the former at the equinoxes, the latter at the solstices. The largest variation of the five-year mean of μ_4 for any month from the twenty-year mean is 10°, and the average for all months is $4°\cdot3$, or seventeen minutes. Considering how small are the absolute values of the coefficients p_4 and q_4, on which the value of μ_4 depends, the average being a little less than $\frac{1}{10}$th of a degree Fahrenheit, it is rather a matter of surprise that the variations should be so small than that they should reach their actual amounts.

It may be noticed that the total amplitude of the components being $\sqrt{(p^2+q^2)}$, a considerable variation of its value is quite consistent with invariable, or slightly varying, values of μ, which depend on the ratio p/q.

The component of the first order, which in the winter is more than double the magnitude of any of the others, and in summer more than ten times as great, gives the dominant character to the daily curves of temperature. In the series of twenty years, variations in different years of as much as 100 per cent. are to be found for almost every month, but for the most part even these irregularities disappear in the mean of a series of five years, and the monthly means for the twenty years are remarkably consistent.

The progression of the value of P, in the course of the year, follows approximately the sine of the sun's meridional altitude, and the empirical formula

$$P = 10 \cos z - 0{\cdot}91$$

gives a close approximation to the values shown in the tables, if a "lagging" of eight or ten days is allowed in reckoning the sun's place.

The second component has two clearly-marked *maxima* about the time of the equinoxes, and a principal *minimum* at midsummer.

The component of the third order varies in a converse manner, having two well-marked *minima* at the equinoxes, with a principal *maximum* at midsummer.

The component of the fourth order appears to combine the characters of the two previous ones, having two *maxima* about the time of the equinoxes, and a principal *minimum* in the winter.

The following empirical formulæ gives close approximations to the values of P_2 and P_3:

$$P_2 = 1{\cdot}08 + 0{\cdot}20 \cos(\lambda + 126^\circ) + 0{\cdot}41 \cos(2\lambda - 2^\circ),$$

$$P_3 = 0{\cdot}42 + 0{\cdot}16 \cos(\lambda + 260^\circ) + 0{\cdot}10 \cos(2\lambda - 172^\circ),$$

in which λ is the sun's longitude.

The mean value of μ for the first component is 214°, corresponding to 2 h. 26 m. p.m., the variation due to season being 12° or 48 m. of time, by which the maximum is earlier in summer than in winter.

In the second order the first maximum in June is 24°, or 1 h. 20 m. earlier than in January.

In the third order the difference in the same direction is 63°, or 4 h. 12 m. of time.

In the fourth order there is some doubt as to the manner in which the change of epoch of the summer and winter maxima is brought about. From March, when the first maximum occurs about 60° after midnight, or 4 a.m., there is a continued retrogression till June, when the maximum is at 16° after midnight, or 1 h. 4 m. a.m. This is followed by a progression from June till October, when the maximum again occurs at about 60°, or 4 a.m.

In passing from October to November a sudden change takes place by which the maximum is established at about 10° after midnight. There is a like sudden change between January and February in the opposite direction, which again brings the maximum to 60° after midnight. From the component in November and February being very small, it is not improbable that these sudden changes may coincide with the component becoming zero.

Remembering that the fourth component includes four series of undulations, the most probable explanation of these changes is to be found in a change of the position of these undulations, during which, between January and February, the first recedes, and its place is taken by the second, which leads to the sudden appearance of a maximum about 60°, or 4 a.m. A similar change between October and November in an opposite direction would introduce the maximum at 10°, after midnight.

In the summer months (May, June, and July) the temperature curve during the day hours, from 8 a.m. to 8 p.m., hardly differs from a curve of sines, the first component being more than ten times as large as any of the others, which therefore influence the temperature, relatively, very little.

The relation of the epoch of the first maximum of the component of the third order to the time of sunrise is decidedly marked, the former occurring, on the average, about 12°, or 48 m. after sunrise; the mean deviation of the interval from that amount being only 7° or 28 m.

The periodical variation in the position of the maximum leads, during the winter months, to a *positive* maximum of this component about 1 p.m., which is combined with *negative* maxima four hours earlier and later, which correspond to the *reduced* temperature in the mornings and afternoons of the *shorter* days. In like manner, in the summer months, when this component has a negative *maximum* about 1 p.m., instead of a negative *minimum*, as in winter, there will be two *positive* maxima, one four hours earlier, the other four hours later, corresponding to the *higher* temperature in the mornings and afternoons of the *longer* days.

It will be seen that these positions of the midsummer and midwinter maximum phases correspond respectively to days of 16 hours with nights of 8 hours, or days of 8 hours and nights of 16 hours, and that at these seasons, when the variations of temperature, due to these differences are greatest, the amplitudes of this component are also the greatest. At the equinoxes, with 12-hour days and nights, the component becomes a minimum; and at this season the change in the position of the maximum takes place as already noticed.

It might be supposed that an analogous relation between the fourth component and the occurrence of days of 18 hours, combined with nights of six hours, and *vice versâ*, is likely to arise. But the data are not forthcoming to test this.

Although the several components of the temperature curve cannot be regarded as indications of specific physical efficient causes, the examination of the graphical representations of the various curves presents points to which attention may usefully be drawn. The chief of these are the following:—

In the summer months the time of morning mean temperature is nearly where the first component becomes zero, the second and third components then balancing one another.

In the winter the time of morning mean temperature is later than in summer, and occurs when a positive value of the first component is equal to a negative value of the second.

The time of afternoon mean temperature throughout the year is somewhat either before or after 7 p.m., and almost exactly coincides with the time when the first and second components are equal, with opposite signs.

In the summer the time of absolute minimum is between the hours of 3 a.m. and 6 a.m., during which the whole of the components are negative.

Sunrise in December is about an hour and a half before the time of mean temperature, while in June it is more than four hours earlier.

Sunset in December is rather more than three hours *before* the time of mean temperature; in June it is about half an hour *after* that time.

The *rationale* of some of the empirical rules for obtaining the mean daily temperature from a limited number of observations is supplied by reference to the harmonic expressions for the hourly deviations of temperature from the mean value, it being borne in mind that the relative magnitude of the fourth component is very small.

In the first place it will be seen that by adding together the harmonic expressions for any two hours twelve hours apart, the whole of the *odd* components disappear, and that the sum is twice the mean value, added to twice the sum of the *even* components of the selected hours, which are equal. Disregarding the components above the fourth order, if the selected hours are such that the component of the second order is zero, which will be the case at hours corresponding to $\mu_2+45°$ or $\mu_2+135°$, then half the sum of the temperatures at the selected hours will be the true daily mean added to the fourth component for the selected hour, which at English stations will never amount to $\frac{1}{2}°$, and on the average is less than $\frac{1}{5}°$.

At Greenwich the mean between the observations at $4\frac{1}{2}$ a.m. or $10\frac{1}{2}$ a.m. and the corresponding afternoon hours in January, will differ by less than $\frac{1}{10}°$ from the true value, and similar results will be obtained for June from the mean of observations made at 3 a.m. or 9 a.m. and the corresponding hours in the afternoon.

By taking the mean of observations at any four hours, at intervals of six hours, both the whole of the odd components, and those of the second order will disappear, and the result will only differ from the true mean by the amount of the fourth component for the selected hours.

As this component disappears when $\mu_4 \pm 22\frac{1}{2}° = 0°$ or $180°$, the hours at Greenwich that will give the best result are 2, 8, 14, and 20, or 5, 11, 17, and 23.

So, if the mean of any three hours at equal intervals of eight hours be taken, the sums of the first, second, and fourth components will disappear, and the result will only differ from the true mean by the amount of the third component for the selected hours, which in no case can be so much as $\frac{3}{4}°$.

By adopting hours when $\mu_3 \pm 30° = 0°$ or $180°$, the third component disappears, and this result will be obtained at Greenwich by combining observations at 3, 11, and 19 hours, or 7, 15, and 23.

2. *Temperature at the Seven Observatories.*

The examination of the tables will show that in their main characteristics the results closely resemble those for Greenwich, and it will not be necessary to discuss them in any detail.

The amplitudes of the components of the first order are, however, in all cases less than that observed at Greenwich, the lowest values being those for Valencia and Falmouth, no doubt due to their position on the sea coast, for which stations the means for the years are 2° · 28 and 2° · 35 compared with 5° · 10 at Greenwich.

The Kew values most resemble those at Greenwich, but the mean maximum at Kew is more than 1° less, and the mean for the year, ½° less.

The mean values of μ_1 for the seven observatories lie between 205° and 220°, that for Greenwich being 214°. The means of the summer values are about 3° or 4° less than the mean of the year, and of the winter values as much above it, as in the case of Greenwich.

The amplitudes of the first components conform approximately, but not so closely as at Greenwich, with the sine of the sun's meridian altitude, but with a flattening of the curve in the summer months, and a tendency at some of the stations to a maximum value in May.

The components of the second and third orders, beyond which the analysis is not carried for these observatories, conform in all important respects to those for Greenwich, the numerical values of the latter being, however, in all cases somewhat higher. The epochs of maximum follow the same laws, with an increased divergence of the summer epoch from that of the winter at the more northern stations.

Making allowance for their smaller amplitude, the empirical formulæ expressing the mean values of the P_2 and P_3 components differ little from those obtained for Greenwich.

In order to test, and in some degree throw light, on the character and significance of the harmonic components of temperature that have been under discussion, and bearing in mind that they cannot be considered to represent separate effects of physical forces operating at the assumed periods of the components, I have, at the suggestion of Professor G. Darwin, computed the harmonic components that would produce a curve representing an intermittent heating action such as that of the sun, continued only during a portion of the day, and commencing and ending abruptly at sunrise and sunset.

All cooling effects have been disregarded, and the sun's direct heating action has been assumed to be proportional to the sine of his altitude; also following the empirical formulæ before given, the power of a vertical sun is taken to be 10. Having calculated the sun's altitude for each hour of the day, for midwinter, the equinox, and midsummer, for certain selected latitudes, the corresponding heating effects have been computed, to which the usual

method of analysis having been applied, the following results are obtained:—

Latitude.	Winter.				Equinox.				Summer.			
	Components.				Components.				Components.			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
0° - -	−4·6	+1·9	0	−0·4	−5·1	+2·1	0	−0·5	−4·6	+1·9	0	−0·4
20 - -	−3·4	+1·7	−0·3	−0·3	−4·7	+2·0	0	−0·4	−5·3	+1·7	+0·3	−0·3
30 - -	−2·8	+1·4	−0·3	−0·3	−4·4	+1·7	0	−0·4	−5·3	+1·6	+0·4	−0·2
40 - -	−1·9	+1·2	−0·4	−0·1	−3·9	+1·6	0	−0·4	−5·2	+1·2	+0·4	−0·1
45 - -	−1·5	+1·0	−0·4	+0·1	−3·5	+1·5	0	−0·4	−5·2	+1·1	+0·4	+0·1
51½ - -	−1·0	+0·8	−0·4	+0·1	−3·2	+1·3	0	−0·3	−4·8	+0·8	+0·4	+0·2
65 - -	0	0	0	0	−2·2	+1·0	0	−0·2	−3·9	0	+0·1	+0·1

These figures represent the values of the components at midnight. The signs indicate that the maximum of the first component is in all cases at 180°, or noon; of the second component the maximum in all cases, is at 0°, or midnight; of the third component in all latitudes the maximum in the winter is at 60°, or 4 A.M., in the summer at 0°, or midnight, the change taking place at the equinox, when the component becomes zero; of the fourth component in the lower latitudes up to 40°, the maximum is at 45°, or 3 A.M., at all seasons; in the higher latitudes the maximum is at 0°, or midnight, in winter and summer, and at 45° or 3 A.M., at the equinox.

For comparison, the following results from actual observations at latitudes specified are also given in similar form:—

Stations.	Winter.				Equinox.				Summer.			
	Components.				Components.				Components.			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Singapore - (Lat. 1° 15′ N.)	−5·0	+1·8	−0·3	−0·2	−6·5	+2·0	+0·7	−0·5	−4·6	+1·5	+0·3	−0·5
Hong Kong - (Lat. 22° 18′ N.)	−2·4	+1·0	−0·7	−0·8	−2·0	+0·7	0·0	−0·1	−1·9	+0·6	+0·1	−0·1
Lyons - - (Lat. 45° 46′ N.)	−2·5	+1·0	−0·4	+0·1	−6·3	+1·5	+0·1	−0·3	−7·6	+0·8	+0·6	+0·2
Greenwich - (Lat. 51° 30′ N.)	−1·7	+0·8	−0·3	+0·1	−4·7	+1·3	+0·2	−0·2	−7·7	+0·6	+0·6	+0·2
Fort Rae - - (Lat. 62° 40′ N.)	−1·1	+0·7	−0·3	+0·3	−7·7	+1·9	+0·4	−0·5	−6·0	+0·6	+0·2	+0·1

The close correspondence of the main features of these two tables is obvious.

The conclusion is unavoidable, that, although both in the actual and hypothetical cases the harmonic components, when combined, are truly representative of the peculiar forms of the curves from which they were derived, this affords no evidence of the existence of recurring cycles of action corresponding to the different components, but indicates that the results are, to a great extent, due to the form of the analysis.

The diurnal curve of temperature is not symmetrical in relation to the mean value, the maximum day temperature being much more in excess than the minimum night temperature is in defect. In order to adjust the first component, which is symmetrical about its mean value, to the actual unsymmetrical curve, it must be modified by the other components. That of the second order which has one of its maxima not far removed from the minimum of the first order supplies the chief portion of the compensation due to this cause.

Further from the character of the analysis, when the diurnal curve is symmetrical on either side of the hour half-way between noon and midnight, that is, when the day and night are equal in length, the third component becomes zero. Any departure from this symmetry introduces a component of the third order, with the result that with a day shorter than 12 hours one maximum will fall in the day between 6 A.M. and 6 P.M., and the other two in the night between 6 P.M., and 6 A.M., while with a day longer than 12 hours, two maxima will occur in the day and only one in the night. In the former case the negative portions of the component correspond with the reduced morning and afternoon temperatures of the short day, and in the latter the two positive phases correspond with the higher temperature of the mornings and afternoons of the longer day.

These conclusions are in conformity with those previously indicated.

The available data are insufficient to enable us to say whether the corresponding results connected with the fourth component are as fully supported by observation as in the case of the third, but the facts so far as they go confirm this view.

It may also be pointed out that, if instead of reckoning the epochs of maximum from midnight, that nearest to noon had been adopted, it would have been seen that there is a distinct tendency for all these epochs to approach noon, affording evidence which is perhaps hardly required that they are all closely dependent on the passage of the sun over the meridian.

For Greenwich the results would be—

	Winter.	Equinox.	Summer.
1st component -	222°	215°	210°
2nd „ -	200	198	181
3rd „ -	194	—	(193)
4th „ -	190	(193)	196

In the case of the third and fourth components, the figures enclosed in brackets are epochs of minimum.

APPENDIX.

APPENDIX I.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1893. The figures opposite to each show the total number of such Logs which they have returned to the Office during the period that they have been observing.

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Andersen, O. E. - -	8	S.S. "Longhirst."
Angus, T. S. - - -	5	S.S. "Ballaarat."
Armstrong, B. G. - -	2	S.S. "Para."
Atkinson, G. W. - -	5	S.S. "Kaisar-i-Hind."
Barclay, J. - - -	1	S.S. "Thermopylæ."
Baxter, A. S. - - -	7	"City of York."
Belding, R. - - -	5	Barque "Atlantic."
Bennett, E. C. - - -	15	"Talus."
Bett, Dr. W., R.N. - -	2	H.M.S. "Stork."
Blackburne, H. S. - -	11	S.S. "Bombay."
Bolton, S. H. - - -	15	S.S. "Edith Hough" and S.S. "Baidar."
Bourke, Capt. E. G., R.N. -	8	H.M.S. "Ringarooma."
Bright, H. - - -	7	Barque "Beltana."
Buchan, J. - - -	22	S.S. "Deramore."
Cameron, J. G., R.N.R. -	9	S.S. "Germanic."
Campbell, R. - - -	9	S.S. "Elton."
Crotty, F. H. - - -	6	"Evesham Abbey."
Crowley, C. - - -	6	"Verajean."
Crutchley, W. C., R.N.R. -	24	S.S. "Kaikoura."
Dart, L. C. - - -	13	Barque "Semantha."
Day, Lieut. E. A., R.N. -	4	H.M.S. "Dart."
Docherty, H. - - -	4	"Tinto Hill."
Dyke, H. W. - - -	10	"Tenasserim."
Elliott, W., R.N.R. - -	5	S.S. "Clan Murray."
England, T. - - -	12	Barque "Glen Grant."
Exham, T. K., F.R.A.S. -	13	S.S. "Tamar."
Field, Comr. A. M., R.N. -	10	H.M.S. "Egeria."
Fraser, W. D. - - -	6	"Corolla."
Frederick, Lieut. and Comr. G. C., R.N.	12	H.M.S. "Dart."
Hand, Sub.-Lt. G. E. B., R.N.	2	H.M.S. "Egeria."
Irving, P. J. - - -	10	S.S. "Teutonic."
Jamieson, D. E. - -	1	S.S. "Port Adelaide."

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Lehman, C. - -	3	"Loch Sloy."
Martin, Walter, R.N.R. -	4	S.S. "German."
Millican, J. W. - -	7	S.S. "Loughrigg Holme."
Milner, W. H. - - -	14	S.S. "La Plata" and S.S. "Trent."
Mitchell, J. - - -	2	Barque "Cape York."
Moignard, P. - - -	6	"Garsdale."
Moore, Capt. W. U., R.N. -	18	H.M.S. "Penguin."
Munn, L. A. - - -	7	S.S. "Trojan" and S.S. "Spartan."
Murdoch, Peter - -	13	"Sierra Lucena."
Parry, M. - - -	17	S.S. "Prydain."
Peebles, R. - - -	16	Barque "Bracadale."
Peterkin, W. - - -	2	"Holkar."
Pope, J. - - -	8	S.S. "Dee," S.S. "Larne," S.S. "Tagus," and S.S. "Essequibo."
Price, J. H. - -	6	Barque "Viola."
Rosseter, W. L. - -	15	"Brenda."
Scott, G. P. - - -	9	"Holyrood" and "Crompton."
Shearer, George - -	12	"Airlie."
Simpson, Alexander - -	15	S.S. "Thermopylæ."
Simpson, Alexander - -	22	S.S. "Traveller."
Smyth, Lieut. and Comr. M. H., R.N.	2	H.M.S. "Stork."
Spalding, T. F. - -	3	S.S. "Australasian."
Streater, R. - - -	3	"Euterpe."
Tait, H. - - -	1	S.S. "India."
Thompson, J. E. - -	5	S.S. "Monarch."
Thomson, A.S., R.N.R., F.R.G.S.	14	S.S. "Silvertown" and S.S. "Dacia."
Travers, H. de la Cour -	10	S.S. "Scot."
Trenaman, R. W. - -	4	S.S. "Pascal."
Trott, S., F.R.Met.Soc. -	22	S.S. "Minia."
Tyson, J, - - -	1	S.S. "Arab."
Walker, H., R.N.R. - -	16	S.S. "Aurania."
Walker, J. J., F.L.S. Ch. E., R.N.	5	H.M.S. "Penguin."
White, W. E., R.N.R. -	6	S.S. "Ormuz."
Wilson, J., R.N.R. - -	9	S.S. "Ethiopia."
Worrall, W. A. - -	2	Barque "Lebu."

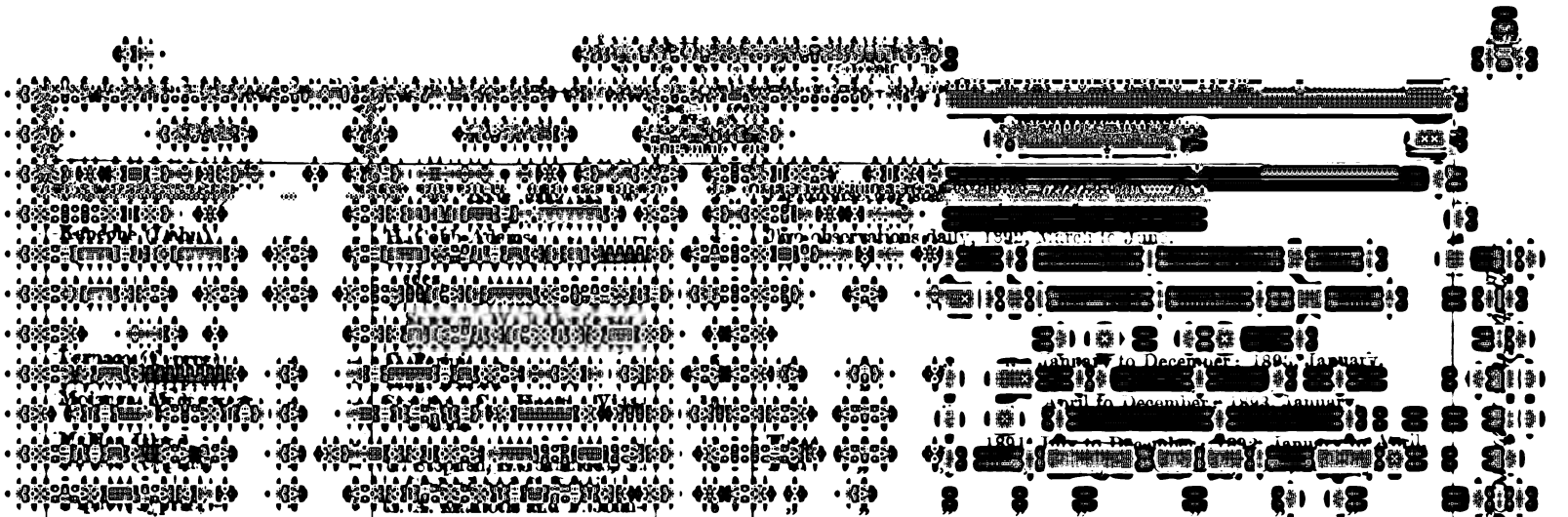
APPENDIX II.—Ships supplied and Documents returned during the year ending 31st March 1893.

The number of merchant ships supplied with standard instruments and meteorological logs during the above period was 116.

The number of logs and documents from Foreign Stations, received during the same period, and registered in the Office, amounted altogether to 351, of which 155 were returned from ships, and the remainder from land stations, outside the British Isles.

List of Documents received from Foreign Land Stations.

Place.	Observer.	No. of Documents.	Nature of Observations.
Abaco (Bahamas)	Joshua Thompson and J. A. Williams, Lightkeepers.	2	Lighthouse Register, 1892, January to December.
Adelaide (Torrens Observatory)	C. L. Wragge, F.R.G.S.	1	One observation daily, 1884, July to December; 1885, January to April and July; 1886, January and February.
Benin River (W. Coast of Africa)	Capt. H. L. Gallwey, Vice-Consul.	2	Daily observations of barometer and thermometer, 1892, April, May.
Beyrout (Lee Observatory)	R. H. West, M.A.	11	Two observations daily, 1892, March to December; 1893, January, February.
Breaksea Island (King George's Sound).	J. A. Symonds	2	Lighthouse Register, 1892, January to December.
Brumana (Mt. Lebanon)	Thomas Little	7	Two observations daily, 1892, March to September.
Cape Juby (N.W. Africa)	W. B. Silverwood	12	" " " 1892, March to December; 1893, January and February.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper	3	Lighthouse Register, 1891, July to December; 1892, January to December.
Cay Lobos (Bahamas)	Byron N. Jones, Lightkeeper	1	" " 1892, January to June.
Cay Sal (Bahamas)	T. R. Thompson, Sen., Lightkeeper.	1	" " 1892, January to June.
Famagusta (Cyprus)	G. Eliades	6	Two observations daily, 1892, January to December; 1893, January.
Futuna, New Hebrides	Rev. W. Gunn, L.R.C.P.	1	Notes of Cyclone on 17th February 1892.
" "	" "	6	Three observations daily, 1887, January to December; 1888, January to July.
" "	" "	5	Two observations daily, 1892, April to September.
George Town (British Guiana)	Robert Ward	8	" " " 1892, February to December.
Gibraltar	Staff-Sergeant R. Scott, Med. Staff Corps.	13	" " " 1892, February to December; 1893, January, February.



	nides.		
Point King (King George's Sound).	S. Mitchell - - -	2	Lighthouse Register, 1891, November to December; 1892, January to November.
Principe Island (West Africa) -	G. R. Scovell - -	1	Two observations daily, 1892, March and May.
St. Helena - - -	H. S. Hands - -	10	One observation daily, 1892, February to December; 1893, January.
„ - - -	„ - -	5	Continuous record of wind (direction and velocity), 1892, February to July, October to December; 1893, January.
Suva (Fiji) - - -	J. D. W. Vaughan, F.R.Met. Soc., F.R.G.S.	11	One observation daily, 1888, March; 1890, May and June; 1891, February to December; 1892, January to December.
Teneriffe (Sitio de Cullen) -	A. F. Perry - -	9	Two observations „ 1892, March to July, October to December; 1893, January, February.
Tobago - - - -	J. P. Tulloch, M.A., M.D. -	11	„ „ „ 1892, February to December; 1893, January.
Trinidad - - - -	J. H. Hart, Supt. Botanic Gardens.	5	„ „ „ „ February to June.
Watling Island (Bahamas) -	T. R. Thompson, jun., Lightkeeper.	2	Lighthouse Register, 1892, January to December.

List of Documents received from Ships.

Captain's Name.	Ship.	Voyage.	Year.
[1] Aagaard, O. O.	S.S. Bellucia	River Plate, Rio Janeiro, and Valparaiso	1891-92
Andersen, O. E.	S.S. Longhirst	Parazuelas and Philadelphia	1892
" "	"	Philadelphia, Marseilles, and Amsterdam	1892
" "	"	Venice, Philadelphia, and Bordeaux	1892
Anderson, Charles	S.S. Achilles	China and Japan, viâ Suez	1890
[2] Angus, T. S.	S.S. Ballaarat	Australia, viâ Suez	1892-93
[3] Armstrong, B. G.	R.M.S. Para	West Indies	1892
[4] " "	"	"	1892-93
Asquith, William	S.S. Deucalion	China, viâ Suez	1890-91
[5] Atkinson, G. W.	S.S. Kaisar-i-Hind	Calcutta, viâ Suez	1892
[6] " "	"	" "	1892-93
Barclay, James	S.S. Thermopylæ	Australia, viâ Cape Good Hope	1892-93
Barr, J.	S.S. Orestes	China, viâ Suez	1890-91
Bartlett, T.	S.S. Diomed	" "	1890-91
Barwise, J.	S.S. Sarpedon	" "	1890-91
Baxter, A. S.	City of York	Cape Town, Astoria, and Valparaiso	1891-93
Belding, Rawstin	Barque Atlantic	River Plate and Valparaiso	1891-92
Bennett, E. C.	Talus	Melbourne, Newcastle (N.S.W.), and San Francisco	1891-92
[7] Blackburne, H. S.	S.S. Bombay	China, viâ Suez	1892
Bolton, S. H.	S.S. Baidar	Mediterranean Ports	1892
[8] " "	"	Ports in Sweden and Spain	1892-93
" "	S.S. Edith Hough	London to Liverpool	1892
Bourke, Capt. E. G., R.N.	H.M.S. Ringarooma	Australia, viâ Suez, and at New Zealand	1891-92
Bright, H.	Barque Beltana	Adelaide	1892-93
Brown, R. J.	S.S. Titan	China, viâ Suez	1890-91
[9] Buchan, James	S.S. Deramore	Pernambuco and New York	1892
Cameron, J. G., R.N.R.	R.M.S. Germanic	New York	1892
[10] Campbell, Robert	S.S. Elton	Savona, and S. Carolina, Baltimore, and Savannah	1892-93
[11] Clift, W. E.	S.S. Amaranth	Cape Town, Mauritius, Rangoon, and home viâ Suez	1892
[12] Clunie, —	S.S. Transvaal	Calcutta, viâ Cape, and home, viâ Suez	1892
[13] Conby, H. B.	Garfield	Calcutta and San Francisco	1891-93
Couper, William	Clackmannanshire	San Francisco	1891-92
Crotty, F. H.	Evesham Abbey	Calcutta, New York, Yokohama, and San Francisco	1891-93
Crowley, C.	Verajean	Newcastle (N.S.W.), Peru, and Otago	1891-92
[14] Crutchley, W. C., R.N.R.	S.S. Kaikoura	Auckland, viâ Cape Town, and Rio Janeiro	1892
[14] " " "	"	" " "	1892
[15] " " "	"	" " "	1892-93
Dart, L. C.	Barque Semantha	San Francisco	1891-92
Davidson, D. C.	Loch Rannoch	Melbourne	1891-92
[16] Davies, D.	Andora	Algoa Bay and Dunedin	1891-92
Day, Robert	S.S. Achilles	China, viâ Suez	1891
De Horne, Morris	S.S. Carthage	Australia, viâ Suez	1892
[17] " "	"	Bombay, viâ Suez	1892
Docherty, Hugh	Tinto Hill	San Francisco	1891-93
[18] Dulling, George	S.S. Port Pirie	Sydney, viâ Cape Good Hope, and Monte Video	1892

	Captain's Name.	Ship.	Voyage.	Year.
	Dulling, George -	S.S. Port Pirie -	Calcutta, Sydney, and home, viâ Suez - - - - -	1892–93
	Dyke, H. W. -	Tenasserim - -	New York, Sydney, and Iquique -	
	Elliott, William, R.N.R.	S S. Clan Murray -	Cape Town, Ceylon, and home, viâ Suez - - - -	1891–92 1892
	„ „	„ „ -	Natal, Madras, and home, viâ Suez	1892
	England, Thomas -	Barque Glen Grant -	Apalachicola - - - -	1891–92
19	Exham, T. K. -	R.M.S. Tamar -	Brazil - - - -	1891–92
19	„ „ -	„ „ -	Lisbon and E. coast of S. America	1892
20	Field, Comr. A. M., R.N.	H.M.S. Egeria -	Hong Kong and North Borneo -	1892
20	„ „	„	Borneo - - - -	1892
	Fisher, T. P. -	S.S. Sirius - -	Rio Janeiro and New York -	1892
21	Fordyce, William -	County of Roxburgh -	Mauritius and Calcutta - -	1892–93
	Fraser, W. D. -	Corolla - -	Valparaiso and Talcahuano -	1891–92
22	Frederick, Lieut. and Comr. G. C., R.N.	H.M.S. Dart - -	New Hebrides - - -	1891
	Gregory, T. M. -	S.S. Menelaus - -	China, viâ Suez - -	1890–91
	Grier, J. K. -	S.S. Antenor - -	„ „ - - -	1890–91
23	Griffin, E. J., R.N.R.	R.M.S. Moor - -	Cape Town - - -	1892–93
	Guthrie, W. E. -	S.S. Bellerophon -	China, viâ Suez - - -	1890–91
	Hannah, W. T. -	S.S. Glaucus - -	„ - - -	1890
19	Hepworth, M. W. C.	S.S. Port Denison -	Sydney, viâ Cape Town, Singapore, and home, viâ Suez - -	1891–92
19	„ „	„ -	Australia, viâ Cape, and home, viâ Suez - - - -	1892
	Huddy, G. R. -	S.S. Akaba - -	New Orleans - - -	1892
	Hutchinson, John -	S.S. Stentor - -	China, viâ Suez - - -	1890–91
24	Irving, P. J. -	S.S. Teutonic - -	New York - - -	1891–92
	Jackson, Charles -	S.S. Palamed - -	China, viâ Suez - - -	1890–91
	„ M. H. F.	S.S. Telamon - -	„ - - -	1890–91
	„ T. S. -	S.S. Palinurus - -	„ - - -	1890–91
25	Jamieson, D. E. -	S.S. Port Adelaide -	Australia, viâ Cape Good Hope, Hong Kong and New York, viâ Suez - - - -	1891–92
	Jones, Henry -	S.S. Telemachus -	China, viâ Suez - - -	1890–91
26	Keane, Lt.-Comr. H. J., R.N.	H.M.S. Herald -	Zambesi and Shiré Rivers - -	1892
	Lapage, W. P. -	S.S. Anchises - -	China, viâ Suez - - -	1890–91
	Lee, W. - -	S.S. Cyclops - -	„ - - -	1890
	„ „ - -	S.S. Polyphemus -	„ - - -	1890–91
	Lehman, C. - -	Loch Sloy - -	Melbourne - - -	1891–92
	Lourison, G. M. -	Eaton Hall - -	Valparaiso and Pisagua - -	1891–92
	Martin, T. C.	Loch Tay - -	Melbourne - - -	1892–93
27	„ W., R.N.R.	S.S. German - -	Cape Town and Mauritius -	1892
27	„ „ „	„ - -	Cape Town, Tamatave, and Port Louis - - - -	1892
28	Miller, Lieut. A. T., R.N.	Training Ship Conway	Off Birkenhead - - -	1892
19	Millican, J. W. -	S.S. Loughrigg Holme	Quebec, Bilbao to Philadelphia, Galveston and Norfolk (Va.) -	1892–93
	Milne, W. F. -	S.S. Maud - -	Davis Straits - - -	1892
	Milner, W. H. -	R.M.S. La Plata -	East Coast of South America -	1891–92
	„ „ -	„ „ -	Pernambuco and Brazil - -	1892
	„ „ -	R.M.S. Trent - -	Brazil - - - -	1892
29	Mitchell, John -	Barque Cape York -	San Francisco and Saigon - -	1891–92
	Moignard, Philip -	Garsdale - -	San Diego (Cal.) - - -	1891–92
30	Moore, Comr. W. U., R.N.	H.M.S. Penguin -	N.W. Australia and Hong Kong -	1891–92
30	„ „ -	„ „ -	China Seas - - -	1892
30	„ „ -	„ „ -	„ - - -	1893
31	Munn, L. A. -	R.M.S. Spartan -	Cape Town - - -	1892
32	„ „	„ „ -	Mauritius, viâ Cape Town -	1892–93
31	„ „	R.M.S. Trojan -	Cape Town - - -	1892

Captain's Name.	Ship.	Voyage.	Year.
Murdoch, Peter -	Sierra Lucena - -	San Francisco - - -	1891–92
Nish, H. - -	S.S. Cyclops - -	China, viâ Suez - - -	1890–91
Owen, O. - -	Barque Cordelia -	Santos - - - -	1891
Parry, Moses -	S.S. Prydain - -	Baltimore, Stettin, Barcelona, and New York - - -	1892
Parson, G. F. -	Earnock - -	Port Pirie - - - -	1891–92
Pattman, Robert -	Barque Loch Torridon	Sydney - - - -	1891–92
Peebles, Robert -	Barque Bracadale -	Fredrikstad (Norway), Newcastle (N.S.W.), and San Francisco -	1891–92
[33] Pentin, Walter -	S.S. Wilcannia -	Adelaide, viâ Cape Good Hope, and home, viâ Suez - -	1892
[33] „ „ -	„ „ -	Australia, viâ Cape, and home, viâ Suez - - - -	1892
Peterkin, William -	Holkar - -	Calcutta - - - -	1892–93
Pope, James -	R.M.S. Dee - -	West Indies - - -	1891
[34] „ „ -	R.M.S. Essequibo -	„ „ - - -	1892–93
„ „ -	R.M.S. Larne - -	„ „ - - -	1891
„ „ -	R.M.S. Tagus - -	E. coast of South America -	1891–92
Price, J. H. - -	Barque Viola - -	Townsville - - -	1891–92
Pulford, I. - -	S.S. Patroclus - -	China, viâ Suez - - -	1890–91
Purdy, Thomas -	S.S. Dardanus - -	„ „ - - -	1890–91
Rawlings, E. S. -	S.S. Ajax - -	„ „ - - -	1890–91
Reynolds, Robert -	S.S. Pretoria - -	Cape Town, &c., Mauritius, and Natal - - -	1892
[35] Rigaud, H. C. -	S.S. Magdalena -	Brazil and River Plate - -	1892
Riley, J. - -	S.S. Teucer - -	China, viâ Suez - - -	1890
[36] Robertson, Lt. and Comr. C. H., R.N.	H.M.S. Herald -	Shiré and Zambesi Rivers -	1892
Rosseter, W. L. -	Brenda - -	Philadelphia and Calcutta -	1892
„ „ -	„ - - -	Calcutta and Demerara - -	1892–93
Scale, R. F. -	S.S. Laertes - -	China, viâ Suez - - -	1890
[36] Scott, G. P. -	Crompton - -	Rangoon - - - -	1892–93
„ „ -	Holyrood - -	Melbourne and Rangoon -	1891–92
Scougall, H. -	Barque Closeburn -	Cape Town, Newcastle (N.S.W.), and Valparaiso - - -	1891–92
Shearer, George -	Airlie - - -	Havre and Calcutta - -	1891–92
Simpson, Alexander	S.S. Thermopylæ -	Australia, viâ Cape Good Hope -	1892
„ „	Barquentine Traveller -	Ivigtut and Copenhagen - -	1892
[38] Smith, J. H., R.N.R.	Training Ship Worcester	Off Greenhithe - - -	1892
[37] „ W. J. -	R.M.S. Tagus - -	River Plate - - -	1892
[38] Smyth, Lieut. and Comr. M. H., R.N.	H.M.S. Stork - -	Formosa Bay - - -	1891–92
Spalding, T. F. -	S.S. Australasian -	Australia, viâ Cape Town -	1891–92
„ „ -	„ -	Cape Town, Melbourne, and home, viâ Suez - - -	1892
Streater, R. - -	Euterpe - -	Wellington - - -	1891–92
[40] Swale, William -	S.S. Brenttor - -	Baltimore - - - -	1892
[41] Tait, H. - -	S.S. India - -	Mediterranean Ports, New York, and Naples - - -	1892
[42] Thompson, J. E. -	S.S. Monarch - -	Off coasts of British Isles - -	1892–93
„ J. S. -	S.S. Nestor - -	China, viâ Suez - - -	1890–91
[19] Thomson, A.S., R.N.R.	S.S. Dacia - -	West Coast of Africa - -	1893
„ „ -	S.S. Silvertown -	Brazil - - - -	1892
Towell, William -	S.S. Jason - -	China, viâ Suez - - -	1890–91
[43] Travers, H. D. -	S.S. Scot - -	Cape Town - - -	1892
[44] Trenaman, R. W. -	S.S. Pascal - -	New Orleans and Monte Video -	1891–92
[45] Trott, Samuel -	S.S. Minia - -	Halifax and Boston Harbour -	1892
[45] „ „ -	„ - -	Halifax - - - -	1892
[46] Tyson, John -	S.S. Arab - -	Natal, Tamatave, and Port Louis -	1892
[47] Wait, A. McLean -	R.M.S. Tartar -	Cape Town - - -	1891–92
[48] „ „ -	„ - -	Natal, &c. - - -	1892
[48] „ „ -	„ - -	Cape Town, &c. - - -	1892–93
Walker, Henry -	S.S. Aurania - -	New York - - - -	1892
Webster, J. K. -	S.S. Prometheus -	China, viâ Suez - - -	1890–91

	Captain's Name.	Ship.	Voyage.	Year.
	White, W. E., R.N.R.	S.S. Ormuz - -	Australia, viâ Suez - -	1892
[40]	" " "	" - -	" " - - -	1892
[50]	" " "	" - -	" " - - -	1892–93
	Wilding, J. - -	S.S. Priam - -	China, viâ Suez - - -	1890–91
	Williams, O. -	S.S. Agamemnon -	" " - -	1890–91
	Wilson, John, R.N.R.	S.S. Ethiopia - -	New York - -	1891–92
	" " "	" - -	" - - -	1892
	Wishart, J. T. -	Sierra Parima - -	Mauritius and Rangoon - -	1892
	Worrall, W. A. -	Barque Lebu - -	Vancouver Island - - -	1891–92

Observations in the Atlantic during the months of October 1856 to March 1857, extracted from the logs of the Cunard steamers "Africa," "America," "Asia," "Arabia," "Canada," "Europa," "Niagara," and "Persia."

In cases distinguished by marginal numbers the Meteorological Registers were kept chiefly by Officers, as follows:—

[1] Kept by E. Rice, Chief Officer.
[2] Kept by S. de B. Lockyer, 1st Officer, G. C. Cockman, 2nd Officer, and J. Mortimer, 5th Officer.
[3] Kept by Messrs. Beall, 2nd Officer, and Custance, 4th Officer.
[4] Kept by T. H. M. Custance, J. B. Thelwall, and G. B. M. Eldridge.
[5] Assisted by Messrs. Smith and Hanswell.
[6] Assisted by Messrs. House and Warren.
[7] Kept by A. B. Armitage, R.N.R., 2nd Mate.
[8] Assisted by J. Richardson, Chief Officer.
[9] Kept by Henry Ward, Chief Officer.
[10] Assisted by Messrs. Sowerby and Evans.
[11] Assisted by George J. Perks, 2nd Officer.
[12] Kept by W. M. Wright, 2nd Officer.
[13] Kept by S. H. Pascoe.
[14] Kept by W. K. McAlpine.
[15] Kept by W. K. McAlpine and E. C. Macey.
[16] Kept by J. H. Jones, 1st Mate.
[17] Kept by H. S. Crauford, 5th Officer.
[18] Kept by Thomas Pott, 2nd Officer.
[19] Assisted by Officers.
[20] Kept by Sub-Lieut. G. E. B. Hand, R.N.
[21] Kept by John MacDonald, Chief Mate, and Malcolm S. Wright, 2nd Mate.
[22] Kept by Lieut. E. A. Day, R.N.
[23] Kept by Alexander L. Galt and T. B. O'Brien, 4th Officer.
[24] Kept by G. J. Caven, 2nd Officer.
[25] Assisted by G. W. B. Woods and G. Pattrick.
[26] Kept by E. St. Maur Nepean, Surgeon, R.N.
[27] Kept by J. George, 3rd Officer.
[28] Kept by the Cadets.
[29] Assisted by Charles Ogilvie, 3rd Officer.
[30] Kept by J. J. Walker, F.L.S., Staff Engineer, R.N.
[31] Kept by Messrs. Joyce and F. C. Dallas.
[32] Kept by F. C. Dallas, 4th Officer.
[33] Kept by Coulton Elliott.
[34] Kept by M. Pearson.
[35] Kept by F. J. Stubbs, 5th Officer, and H. J. Latterley.
[36] Assisted by J. J. Murphy and F. Lampard.
[37] Kept by F. J. Stubbs and F. W. Fooks.
[38] Kept by William Bett, Surgeon, R.N.
[39] Kept by Andrew Robb, 2nd Officer.
[40] Kept by J. Seddon, 2nd Officer.
[41] Kept by D. J. Evans, 2nd Officer.
[42] Kept by Officers.
[43] Kept by Henry Bowyer, 2nd Officer.
[44] Assisted by Mr. Williams, 2nd Officer.
[45] Kept by W. G. Squares, Chief Officer.
[46] Kept by J. W. Hague, Chief Officer.
[47] Kept by 3rd and 4th Officers.
[48] Kept by F. P. MacCarthy, 4th Officer.
[49] Assisted by Messrs. May, Coysh, and Truscott.
[50] Assisted by Messrs. Hoare, Coysh, Gaoe, and Truscott.

APPENDIX III.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Barometers.	Aneroids.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1892, afloat - -	215	522	1,374	297	279	170	76
Issued since - -	85	116	355	71	88	33	54
	300	638	1,729	368	367	203	130
Returned since - -	73	106	333	59	54	18	37
April 1st, 1893, afloat -	227	532	1,396	309	313	185	93

INSTRUMENTS supplied, &c. for use at Naval Stations.

April 1st, 1892, in use -	70	66	288	29	28	5	11
Issued since - -	5	7	29	8	11	2	2
	75	73	317	37	39	7	13
Returned since - -	2	8	63	1	1	—	—
April 1st, 1893, in use -	73	65	254	36	38	7	13

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1893.

Afloat in Royal Navy - -	227	532	1,396	309	313	185	93
In use at stations - -	73	65	254	36	38	7	13
In store at M.O. - -	29	65	114	52	68	12	26
„ Chatham - -	3	13	16	13	14	3	15
„ Sheerness - -	7	6	13	6	5	5	6
„ Portsmouth -	16	48	29	11	12	5	5
„ Devonport -	14	23	28	7	7	4	16
„ Queenstown -	1	4	20	1	1	—	4
„ Gibraltar - -	3	4	12	3	3	—	4
„ Malta - -	13	16	52	10	9	2	6
„ Bombay - -	4	6	17	3	4	1	4
„ Halifax - -	4	8	24	5	4	—	14
„ Bermuda - -	4	7	13	4	9	—	4
„ Jamaica - -	6	3	29	2	2	—	—
„ Cape of Good Hope	2	4	21	4	5	2	4
„ Trincomalee -	4	4	16	3	3	—	4
„ Hong Kong -	21	15	39	13	13	—	22
„ Coquimbo -	4	6	16	4	5	1	19
„ Sydney - -	2	6	15	4	3	1	7
„ Esquimalt - -	7	7	9	4	3	—	—
Total, April 1st, 1893 -	444	842	2,138	494	521	228	266
Lost, &c. since April 1st, 1892	9	15	294	31	17	14	19
Under repair - - -	20	—	—	—	—	—	—

APPENDIX IV.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Barometers.	Compasses.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1892, afloat - -	106	—	667	—	—	102	361
Issued since - - -	70	—	410	—	1	68	218
	176	—	1,077	—	1	170	579
Returned since - -	60	—	410	—	—	57	201
April 1st, 1893, afloat - -	116	—	667	—	1	113	378

INSTRUMENTS at Stations, viz., Telegraph Offices, Observatories, Fishing Villages, &c.

April 1st, 1892, in use - -	278	2	251	54	60	54	11
Issued since - - -	14	—	24	8	6	6	2
	292	2	275	62	66	60	13
Returned since - -	9	—	17	5	2	5	3
April 1st, 1893, in use - -	283*	2	258	57	64	55	10

DISPOSITION of Board of Trade Instruments on April 1st, 1893.

In merchant ships - -	116	—	667	—	1	113	378
In use at stations - -	283	2	258	57	64	55	10
In store at M.O. - -	19	4	207	—	25	13	37
At Liverpool Agency -	12	7	50	—	—	13	44
„ Aberdeen „ -	3	—	29	—	3	3	22
„ Glasgow „ -	4	—	12	—	—	3	8
„ Dundee „ -	11	—	18	—	—	9	14
„ Hull „ -	8	—	30	—	—	6	25
„ Cardiff „ -	4	—	36	—	—	6	16
„ Southampton „ -	7	—	42	—	—	9	27
Total, April 1st, 1893 -	467	13	1,349	57	93	230	581
Lost, &c. since April 1st, 1892	5	—	172	1	—	14	60

* Of these barometers 192 are lent for use of seafaring communities at fishing villages and ports.

APPENDIX V.

List of Stations reporting Meteorological Observations to the Office by Telegraph on 31st March 1893, with the Names of Observers.

*†Sumburgh Head	Rev. W. Brand	Minister of Dunrossness.
*†Stornoway	J. Forbes	Nicolson Institution.
Wick	J. Sinclair	Watchmaker.
Nairn	Miss Penny	Schoolmistress.
*†Aberdeen	W. Boswell	Assistant at the Observatory.
Leith	T. Richardson	Telegraph Clerk.
*†Shields	J. W. Irvine	Do.
Spurn Head	G. Freeman	Lightkeeper.
†York	H. M. Platnauer, F.G.S.	Curator of Museum.
Loughboro'	W. Berridge	
†Ardrossan	J. W. Mayes	Telegraph Clerk.
†Malin Head	O. O'Doherty	Signalman, Lloyd's.
*†Mullaghmore	K. Kerr‡	Retired Coastguard Officer.
*†Belmullet	Miss M. J. Tolan	Telegraphist.
†Donaghadee	T. MacGowan	Postmaster.
Parsonstown	W. J. Perry	For The Earl of Rosse, K.P.
*†Holyhead	Capt. Richards	Keeper of Sailors' Home.
Liverpool	W. E. Plummer, F.R.A.S.‖	Bidston Observatory.
*†Valencia	J. E. Cullum, F.R.Met.Soc.	Superintendent of the Observatory.
†Roche's Point	W. Kennedy	Telegraph Clerk.
Pembroke	S. Blake	Lightkeeper.
*†Scilly	A. Hicks	Signalman.
Prawle Point	W. Hewitt	Coastguard Officer.
†Hurst Castle	G. G. Appleton	Lightkeeper.
†Jersey	J. Fisher	Station Master.
*†Dungeness	W. Batton	Assistant Lightkeeper.
†North Foreland	A. Cox	Signalman, Lloyd's.
*†London	F. Gaster, F.R.Met.Soc.	Clerk, Meteorological Office.
Oxford	W. Wickham	Radcliffe Observatory.
Cambridge	H. Todd and P. Morris	Observatory.
*†Yarmouth	G. T. Watson	Secretary, Sailors' Home.
§Hawes Junction	W. H. Bunce	Station Master.

In addition to the above, reports are received daily from the following Continental Stations.

Station.	Authority.	Station.	Authority.
Haparanda	Meteorological Office, Sweden.	†The Helder	Bureau Central Météorologique, Paris.
Hernösand		Cape Gris Nez	
†Stockholm		†Brest (St. Mathieu)	
Wisby		Lorient (Île de Groix)	
Bodö	Meteorological Institute, Norway.	*†Rochefort (Ile d'Aix)	
†Christiansund		†Biarritz	
*†Skudesnaes		†Paris	
Færder		Belfort	
		Lyons	
		Nice	
†The Scaw	Meteorological Institute, Denmark.	Perpignan	
Fanö		Berlin	Cent. Met. Inst. of Germany.
Cuxhaven	Deutsche Seewarte, Hamburg.	Wiesbaden	
		Munich	
		Corunna	Observatory, Lisbon.
		†Lisbon	

Note.—The stations marked with an asterisk (*) report also at 2h. p.m., and those with a dagger (†) at 6h. p.m.; Lisbon reports at 4h. p.m. instead of 6h. p.m. Paris and the Helder do not report at 6 p.m. on Sundays.

‡ Observer since dead.

§ This station now reports by post only at the close of each month.

‖ Mr. Hartnup died on 21st April 1892.

APPENDIX VI.

Report of Inspection of the Irish and Welsh Stations, 1892.

I have to report that I have completed the inspection of all the Irish stations, and of the Welsh ones, except Llandovery. The time occupied has been five weeks.

Telegraphic Stations.

Holyhead, visited September 15th.—The station is in good order, but the shrubs about the rain-gauge have been allowed to grow too high.

Donaghadee, visited September 15th.—At this station the instruments were all in good order. The observer's health has failed, and the observations are now taken, in bad weather, by his brother, who was at one time the regular reporter.

Malin Head, visited September 23rd.—I found this station in good order. The observer is very intelligent.

Mullaghmore, visited September 26th.—I deposited at this station the self-recording aneroid as authorised by the Council. The instruments were in good order.

Belmullet, visited September 28th.—At this station I found that the vane recently erected had been set to magnetic bearings, and this I had set right. The instruments were otherwise in good order. The observer's brother, who had formerly been the assistant, had left the place; a younger sister had taken his place.

Parsonstown, visited October 4th.—The observer here had been changed, and the present reporter is named William James Perry. He is a National school teacher, well educated, and careful. His absence from the observatory during school hours is a serious inconvenience, but I cannot see how this can be obviated.

Roche's Point, visited October 7th.—This station calls for no remark. The instruments were all in good order. The barometers have been placed in a much better light than formerly.

Valencia Observatory, visited October 11th.—At this station the instruments were all in good order. The Stevenson screen had fallen to pieces, and a new one has been ordered to replace it. I find that the hill opposite interferes with the sunshine for an hour or two in the mornings, at least in the winter half year.

St. Ann's Head, visited October 15th. At this station all was in good order. The observer, Mr. Blake, is likely to leave ere long on promotion. His successor will be Mr. Knott, and Mr. Blake is instructing him.

Weekly Weather Report Stations.

Llandudno, visited September 14th.—I inspected the sunshine recorder. Its action is not quite satisfactory, as it received accidental damage at its former position on the Great Orme's Head. I am recalling it for repair, supplying another for use in the interim.

Londonderry, visited September 22nd.—At this station the observer had recently procured a maximum thermometer, an instrument which

he had not had for some months, since the recall of one lent to him by the Office. Otherwise the instruments were in good order, as before.

Edenfel, Omagh, visited September 24th.—This is a new station. Colonel Buchanan, the observer, has a good situation, but the thermometer screen is placed in a corner, out of the way of lawn tennis. The instruments are good and in good order.

Mount Trenchard, visited October 5th.—This station was in good order. No other observations than rainfall and extreme temperatures, maximum and minimum, are taken.

Killarney, visited October 10th.—This station was in good order, as usual.

Waterford, visited October 13th.—This station was in good order.

Kilkenny Castle, visited October 14th.—This station was also in good order. I am glad to say that the inner can of the rain-gauge has been enlarged so as to receive a larger quantity without overflow.

Stations of the Second Order.

Dublin City, visited September 16th.—Was as satisfactory as is possible in a locality so confined as that which it occupies.

Mountjoy Observatory, visited September 16th.—This station is in good order. It is the most satisfactory, as to exposure, of all the stations that I visit.

Glasnevin, visited September 17th.—This station was in good order. I found a nest of a mason bee inside the rain-gauge. It did not interfere with the tube at the bottom, and had apparently not been there for long.

Lissan, visited September 20th.—At this station, which was in good order, the observer had been changed, the gardener, Donaldson, having left.

Armagh, visited September 20th.—This station was quite satisfactory. I found that the anemometer hut, which is placed standing loosely on a leaded roof, required to be moved, as a crack had apparently occurred in the lead under it. The hut has been in the same place for 40 years. Dr. Dreyer undertook that this operation should be carried out with the greatest care, so I authorised its being effected.

Colebrooke, visited September 21st.—The instruments were in very good order.

Londonderry, visited September 22nd.—At this station the exposure is very imperfect, as the bushes in the garden interfere with the rain-gauge. The observations are, however, taken carefully.

Markree, visited September 27th.—At this station, which is in very good order, a railing has been put up round the thermometer screen, which is a great improvement on previous arrangements.

Currygrane, Edgeworthstown, visited September 30th.—At this station the observer has been changed, and the present youth has not yet got quite experience enough. He is, however, careful and is improving.

Arley Cottage, visited October 3rd.—At this station Major Maxwell was absent, but H. Usher, the gardener, was in attendance. It is an exceptional station, being very close to a large sheet of water (Lough Sheelin). The observations are carefully taken.

Parsonstown, visited October 4th.—The remarks on this station are given under the head of Telegraphic Stations.

St. David's, visited October 17th.—This station was, as usual, in very good order.

(Signed) ROBERT H. SCOTT.

Corrections to be applied to the readings of the thermometers :—

STATIONS.	Dry Bulb.	WetBulb.	Max.	Min.	Spare.	Remarks.
			TELEGRAPHIC REPORTING STATIONS.			
	°	°	°	°	°	
Holyhead - -	0·0	−0·2	−0·5	+0·2	−0·5	
Malin Head - -	−0·2	−0·2	0·0	−0·9	−0·7	Max. and min. thers. both new.
Mullaghmore -	−0·3	−0·3	−0·2	+0·7	−0·3	
Belmullet - -	−0·4	−0·3	−0·1	−0·3	—	
Donaghadee - -	−0·4	−0·4	+0·2	−0·1	−0·7	
Parsonstown - -	−0·7	+0·1	−0·6	+1·1	—	
Valencia (Cahirciveen)	−0·6	−0·6	−0·6	−0·1	−0·4	
Roche's Point -	−0·4	−0·4	−0·4	0·0	—	
St. Ann's Head -	−0·6	0·0	+0·1	−0·1	−0·2	
			WEEKLY WEATHER REPORT STATIONS.			
Edenfel, Omagh -	—	—	+0·1	−0·1	—	New station for W. W. Report.
Kilkenny Castle -	—	—	−0·1	0·0	—	
Waterford - -	−0·2	−0·2	0·0	0·0	—	
Killarney - -	−0·4	−0·4	−0·1	0·0	—	
Foynes - -	—	—	−0·3	+0·1	—	
			STATIONS OF THE SECOND ORDER.			
Armagh - -	−0·4	−0·5	−1·3	—	−0·4	Grass min. +1·0. Min. therm. of Casella's pattern.
Brookeborough -	−0·6	−0·9	−0·4	−0·1	—	
Dublin (City) -	−0·4	−0·5	−0·8	0·0	—	Grass min. −0·3.
Dublin (Phœnix Park)	−0·5	−0·6	−0·3	+0·1	—	Do. 0·0.
Edgeworthstown -	−0·5	−0·5	−0·6	+0·3	—	Do. −0·1.
Glasnevin - -	−0·3	−0·4	−0·9	+0·2	—	Do. +0·2.
Lissan - -	−0·2	−0·3	−0·1	+0·1	—	
Londonderry -	−0·4	−0·3	+0·8	+0·6	—	
Markree Castle -	−0·2	−0·3	0·0	+0·3	—	
Mount Nugent -	−0·2	−0·2	+0·7	0·0	—	Do. +0·5.
Parsonstown - -	−0·7	+0·1	−0·6	+0·2	—	Do. +2·3.
St. David's - -	−0·4	−0·5	+0·2	−0·2	—	Do. 0·0.

REPORT OF INSPECTION OF SCOTTISH STATIONS FOR 1892.

BAROMETERS.

The comparison of these instruments was made with inspector's standard barometer No. 690, which I have reason to believe remained correct during the tour of inspection. The barometer at Braemar was found to read about half a tenth inch too low. The instrument was rectified, and read thereafter the same as the standard. The barometers at the other stations were in good order, and at all stations the readings were very accurately made, and reduced correctly, where it is the practice of the observer to reduce his observations. The following table gives the readings of the standard barometer alongside the station barometers :—

TABLE I.

Stations.	Inspector's Standard Barometer No. 690 corrected.	Reporting Barometer uncorrected.	Check Barometer uncorrected.	Remarks.
	Inches.	Inches.	Inches.	
Fort William	29·820	29·818	—	
Fort Augustus	29·842	29·826	—	
Lairg	29·585	29·570	—	
Dunrobin	29·860	29·863	—	
Wick	29·810	29·806	29·750	Check barometer is higher up in house.
Deerness	29·378	29·370	—	
Dunrossness	29·582	29·570	29·580	
Aberdeen	29·284	29·284	29·282	
Braemar	28·303	28·303	—	
Gordon Castle	29·486	29·492	—	
Stornoway	30·077	30·090	30·070	
Glencarron	29·558	29·561	—	
Nairn	29·793	29·786	29·790	
Lednathie	29·213	29·212	—	
Dundee	29·734	29·730	—	
Marchmont	29·156	29·160	—	
Ladylaw	29·152	29·154	—	
Wolfelee	28·610	28·606	—	
Ardrossan	29·262	29·253	—	
Glasgow Observatory	29·106	29·108	—	
Leith	30·127	30·128	30·131	
Rosewell	29·408	29·398	—	

THERMOMETERS.

These were all compared with standard thermometer No. 4483, and the results are detailed in Table II., which shows the readings of the standard and the errors of the different instruments ascertained by the comparison. The following minimum thermometers were found out of order:—At Gordon Castle 0°·6 of spirit was lodged at the very top of the tube; this was put right, and the observer was shown the method of doing it when the quantity evaporated is small. At Rosewell, 4°·0 was lodged near the top of the tube, which the observer, under direction, put right; and he was very specially shown the long time required till the whole of the spirit runs down and joins the column of spirit.

TABLE II.

Stations.	Standard No. 4483, corrected.	Dry Bulb.	Wet Bulb.	Spare Thermometer.	Max. Thermometer.	Min. Thermometer.	Time in Water.	Change of Temperature.	Remarks.
	°	°	°	°	°	°	′	°	
Fort William	60·0	+0·1	+0·1	—	0·0	0·0	90	Uniform	
Fort Augustus	56·5	+0·1	+0·1	—	+0·2	−0·4	90	Do.	
Lairg	62·7	+0·1	+0·2	—	−0·3	0·0	90	+0·3	
Dunrobin	61·9	−0·6	−0·6	—	−0·1	−0·4	135	+0·5	
Wick	58·8	+0·4	+0·5	—	0·0	+0·1	75	Uniform	
Deerness	58·7	+0·1	0·0	—	−0·8	−0·1	90	+0·3	
Dunrossness	55·3	+0·5	+0·5	+0·2	0·0	0·0	150	−0·4	
Aberdeen	55·7	+0·3	+0·3	—	+0·3	+0·1	} 80	Uniform	
Do. Observatory	55·7	—	—	—	−0·3	−0·3			
Braemar	54·2	+0·3	+0·4	—	−0·1	−0·2	95	Do.	
Gordon Castle	55·8	+0·2	+0·1	—	+0·2	0·0	75	Do.	Min. was 0°·6 out of order.
Stornoway	54·1	+0·5	+0·5	—	−0·4	−0·6	120	+0·5	
Glencarron	53·0	0·0	−0·1	—	−0·2	−0·2	130	+0·7	
Nairn	55·0	+0·7	+0·7	—	0·0	−0·2	65	+0·2	
Lednathie	55·3	+0·2	+0·1	—	+0·3	−0·2	120	+0·7	
Dundee	54·6	+0·4	+0·3	—	+1·3	−0·3	65	Uniform	
Marchmont	52·0	0·0	−0·1	—	0·0	0·0	240	+0·5	
Ladylaw	56·2	0·0	0·0	—	−0·2	0·0	75	+0·3	
Wolfelee	51·5	−0·2	−0·3	—	+0·1	−1·1	150	−0·4	
Ardrossan	49·5	+0·1	+0·2	—	−0·3	−0·3	140	Uniform	
Glasgow Observatory	47·9	—	—	—	0·0	0·0	200	Do.	
Leith	50·1	0·0	+0·2	—	0·0	−0·4	60	Do.	
Rosewell	54·0	−0·2	−0·2	—	+0·3	−0·4	80	Do.	Min. was 4°·0 out of order.

Hygrometers.

At Stornoway, on opening the screen, the difference between the dry and wet bulbs was only 0°·8, though at the time the weather was fine and the air dry. The wet-bulb was plainly out of order. A fresh piece of muslin was put on, and the hygrometer placed in the screen and read again after some time with a resulting difference of 5°·8, between the dry and wet-bulb readings. The observer was shown how to keep the instrument in better order. At all other stations the wet-bulbs were well-mounted and in good order. During the excessively damp atmosphere of October 3rd and 4th, differences of only 0°·4 between the dry and wet-bulbs were noted at Hawick and Marchmont.

Other Instruments.

At Ardrossan it was necessary, as leaking had commenced, to order the receiver to be re-bottomed; and, owing to the erection of new buildings, to change somewhat the positions of the sunshine recorders at Stornoway and Fort William. Those instruments were in good order at all stations.

Fort William, August 19th.—The thermometer screen of the observatory was repainted in the end of June, and the Stevenson screen is ordered to be repainted. The Beckley rain-gauge now works well, and the differences between the two rain-gauges are very slight. As there is a difference for the year 1891 of about 9 inches between the annual amounts of the rainfall at the observatory and the schoolhouse (the old rain-gauge of station), it has been proposed to place another gauge in the grounds, with the view of seeing if the difference be due to the degree of proximity to the rising ground behind the houses in this part of Fort William. The building of a house on the ground adjoining has necessitated the removal of the sunshine recorder to a new position reached by the sun at all hours when above the visible horizon. The instruments are in excellent order, and the observations are made punctually and accurately.

Fort Augustus, August 20.—The instruments are all in good order. The Rev. A. W. Blundell and assistant were both from home at the time of my visit, Father Martin, the previous observer, being in temporary charge.

Lairg, August 22nd.—All the instruments are in admirable order, and are well observed.

Dunrobin, August 23rd.—The instruments are in good order, and the observations are made carefully and intelligently.

Wick, August 24th.—The minimum thermometer is in good order, and a new maximum was supplied to replace the one broken when the screen was blown down during a heavy gale. The garden having been considerably enlarged, the rain-gauge and Stevenson's screen have been removed to good and more open positions, the screen, a new one, being finished in a good workmanlike manner. Since last year's inspection the porcelain of the wet-bulb thermometer was broken at the upper screw and repaired at the time, so that the porcelain scale from which the readings are taken read 2°·8 too high; and as thereafter the observer subtracted only 2°·0 from each reading, these wet-bulb readings have been nearly a degree too high. Mr. Sinclair observes with great intelligence and care, and in future particular attention will be given to report extreme wind-force in gales.

Deerness, August 26th.—The maximum thermometer in use since the instruments were transferred to this station from Stennis reads 0°·8.

too low. The thermometer, sunshine-recorder, and other instruments are particularly well attended to, and the observations are read expertly and correctly.

Dunrossness, August 30th.—In the absence of the Rev. W. Brand in Fair Isle, Mrs. Brand was in charge, who made all the observations with remarkable care and correctness, and the instruments, including the minimum thermometer, were all in excellent order. A Richard's barograph was added to the outfit of the station.

Aberdeen, September 2nd.—Everything as respects instruments and observations is in excellent condition, leaving, indeed, nothing to be desired.

Braemar, September 1st.—As had been suspected, the barometer was 0°·050 inch too low; but after inversion and tapping, a second reading was taken, which agreed with standard No. 690 I carry with me. All the other instruments are in very good order, and the observations are made with much care and intelligence.

Gordon Castle, September 3rd.—A new maximum thermometer was added in November 1891, to replace the old one, a Phillips, whose index had been lost. About 0°·6 of spirit at the top of the minimum tube was dislodged and the instrument put right, the observer being shown the way when the evaporated portion is small and at the very top of the tube. The instruments are otherwise in good order, and the observations made with intelligence and accuracy.

Stornoway, September 6th.—On opening the thermometer screen, the dry-bulb read 59°·6 and the wet 58°·8, the muslin being almost dry. After being properly wetted sometime after and exposed in the screen (closed) the readings were 58°·8 and 53°·0. Instructions were given as to obviating the recurrence of such faulty readings in future. The sunshine recorder was ordered to be raised 6 feet, owing to the additions which have just been made to the school buildings. Otherwise the instruments are in very good order, and much care and intelligence shown in making the observations.

Glencarron, September 8th.—The instruments continue to be in excellent order and are well attended to. The small barograph, thermograph, and hygrograph were all in good working order.

Nairn, September 9th.—The Stevenson screen was ordered to be repainted, and furnished with new hinges and ventilator. Otherwise the instruments are in very good order; and much care is evidently taken by Miss Penny, her sister and brother, who assist, in securing uniformity in the methods of making the observations.

Lednathie, September 10th.—Since last inspection a H.C. anemometer has been added to this station. Mr. Morrison keeps the instruments in admirable order, and evinces much care and shrewd observation in carrying on the work.

Dundee, September 12th.—The instruments are all in good order, and the observations continue to be made with accuracy and intelligence.

Marchmont, October 3rd.—The instruments continue to be kept in very good order, and great intelligence is manifested in carrying on the observations.

Ladylaw, Hawick, October 4th.—The instruments and observations leave nothing to be desired, much enthusiasm and great labour in reducing the observations being manifested by Mr. Wilson.

Wolfelee, October 5th.—The instruments are in good order, and the observer is particularly careful and intelligent.

Ardrossan, October 6th.—The receiver of the rain-gauge was ordered to be repaired. The station is presently in charge of Mr. J. Scott, assistant, owing to the serious illness of the chief observer. Mr. Scott observes with care and correctness.

Glasgow Observatory, October 7th.—New tubes have been fitted to the thermograph to replace the old ones which had been broken. Everything was in excellent order and working well, and the observations are made with much care and correctness.

Clober, October 7th.—The observations at this station are at present in abeyance owing to the state of Mr. Bertram's health, which obliged him to leave Clober for the Continent in the beginning of the year.

Leith, October 11th.—The Stevenson screen and the railing round the outdoor instruments were ordered to be repaired; but everything else is in good order, and the new observer is attentive and accurate in what he does.

Rosewell, October 14th.—Nearly 4°·0 of spirit was lodged near the top of the tube of the minimum thermometer, which had recently got out of order. Under my direction the observer put it right. With this exception the instruments are all in good order; and the observer is greatly interested in the work, which he does carefully, correctly, and with more than usual fulness.

(Signed) ALEXANDER BUCHAN.

REPORT of INSPECTION of the ENGLISH STATIONS, 1892.

TELEGRAPHIC REPORTING STATIONS.

Dungeness, inspected June 9th.—Levelling once more at this station with such accuracy as the state of the tide would permit, I concluded that the real height of the barometer cisterns above M.S.L. is between five and six feet greater than that previously estimated; but I will endeavour in 1893 to secure finality on this question. The instruments at the station were all in excellent order, and the observers at the time of inspection read them correctly, although I regret to say that the barometric readings, as reported, are by no means in all cases dependable.

The frequent low temperatures of Dungeness beach and Romney Marsh in winter, as contrasted with temperatures of most other parts of our southern coasts, have been alluded to in a former report, as has also been the excellent exposure of the station to winds from all points. I will mention here my impression that over this very level promontory there is a remarkable deficiency in the quantity of summer cumulus.

Hurst Castle, inspected June 13th.—The instruments were all in good condition and are carefully attended to. Although little more than instrumental observations can be expected from Mr. Appleton, it may be worth remarking that halos are more frequently reported from this station and from St. Aubins, Jersey, than from other telegraphic stations. This simply indicates that the observers at these two stations pay attention to the appearance of the sky; and any inference to the effect that the frequency of the report adequately represents the frequency of the occurrence, and, still more, any inference that the phenomena mentioned are commoner in the south than in the north of the British Isles, would, I think, be inadmissible.

As formerly remarked, the force and direction of the wind at Hurst are considerably affected by the course of the Solent and by the elevations of adjacent land surfaces.

Prawle Point, inspected June 16th.—The barometers are very accurately read by Mr. Hewitt and by the assistant observer, Mr. Fenton. The wet-bulb reading higher than the dry bulb when the two are fairly compared, it happens that occasionally when saturation is attained or closely approached, the observer, in reading to whole degrees only, finds the wet bulb higher by a degree than the dry; in these cases he has habitually reported the dry-bulb reading as that of both the thermometers, for the purpose of avoiding queries. The instruments were all well attended to. Estimations of wind and of sea disturbance are (if we adopt the usual standards for these estimations) very correctly made at this station.

Scilly, visited June 18th–19th.—Except that the ventilator of the thermometer screen required a cap, all the apparatus and instruments at this station were in good condition. The anemographic tracings have undergone no alteration. The observer, Mr. Hicks, on his rare occasions of absence, leaves the work of observation to his son, or, now and then, to young Mr. Thomas, the son of the former observer. Each of these is a fairly efficient substitute. I had thought the observer to have made progress in attention to the telegraphy of important pressure changes indicated by the self-registering aneroid, but I regret to find that this part of his work is still inadequately performed.

I again called the observer's attention at this, as at some other stations, to the importance of reporting the duration of gales, an element of some slight difficulty when gales occur at night. Direction and force of wind are reported from Scilly as accurately as from any other station, but sea disturbance cannot in every instance be quite as correctly estimated.

Cambridge, visited July 16th.—The instruments here were in good order. Some of the barometer readings had not, previously to my visit, been accurately taken. I have lately learned that Mr. Todd has resigned his post, and the work is now under the superintendence of Mr. Morris.

North Shields, inspected July 22nd.—The reports from this station are promptly transmitted, and are, in general, dependable. Some cases had occurred in which the reported barometer readings were apparently too low. This I found to be probably due to want of experience on the part of a clerk, who had occasionally been deputed to read the instruments. A letter was sent by Mr. Scott to the observer soon after the receipt of my inspection notes calling attention to this matter, and the fault is not, I think, likely to recur.

The rain-gauge had again been repaired. The hygrometer was, as usual, somewhat dirty.

York.—Up to the date of my visit, July 23rd, no change had been traceable in the character of the reports from this station. The observations are fairly well taken, although the observer is sometimes not sufficiently careful in taking his barometer readings. I have, as usual, to complain of want of punctuality at this station. I laid a strong protest on this subject before Mr. Platnauer, the Curator of the Museum.

The hygrometer was this year found to be in a satisfactory state.

Liverpool (Bidston Observatory), inspected November 23rd.—The Council has, by the death of Mr. Hartnup, lost the services of an experienced observer. The observations are now under the superintendence

of Mr. Plummer, while Mr. Skinner continues, as assistant, to conduct a great part of the work.

The hygrometer was not perfectly clean, but the other instruments were in excellent order. As in 1891, the corrections required for all the thermometers were found to be trivial.

Stations of the Second Order.

Eastbourne, June 11th and 12th.—The observations at this station continue to be most carefully conducted, and the observer, Mr. Sheward, is very painstaking. None of the thermometers require the application of corrections. The barometer is a good instrument, but it is somewhat difficult to adjust the vernier, some of the cogs of the pinion being worn out. The observer, in mounting the hygrometer, winds the thread round the bulb without the use of a piece of muslin, because he does not trust himself to fasten the muslin at the screen, and his house is in a different part of the town. As carried out by him the plan need not, I think, be interfered with.

The new rain-gauge, mentioned as in readiness in my report for 1891, was placed in position immediately after my visit in August of that year. The utility of its external iron case was shown by some dents in the latter, and by the fact that a few stones lay round the instrument.

Plymouth, June 21st and 22nd.—At the date of my visit the barometer stood in one of the upstairs rooms of the Biological Laboratory, on the roof of which building the sunshine recorder had been placed, having here a better exposure than that which it first had at the Navigation School, and subsequently at the house of the late Dr. Merrifield. The thermometer screen and rain-gauge had a very good exposure on land which is the property of the borough. Mr. Dickson, who had conducted the observations admirably, had, at the time of my visit, just sent in his resignation. I obtained a promise from Dr. Williams, the Medical Officer of Health, that the observations should be continued by the Borough. The work is now under the superintendence of Mr. H. Victor Prigg, the Borough Surveyor, at whose residence the barometer is kept; and the record up to date is very good.

Sheffield, visited July 19th.—The observations at this station are conducted, as before, at the Museum at Weston Park, and are very satisfactory. The returns had been in arrear at the time of my visit, but this, owing to the duties of the Curator, is sometimes unavoidable. The records are admirably filled in. In the occasional absence of Mr. Howarth, his assistant takes the readings of the instruments, and does so with accuracy. Hitherto the 9 p.m. observations had not been entered, although I had repeatedly urged their importance. Arrangements were made that these observations should be commenced on January 1st, 1893. The barometer, as mentioned in previous reports, is a good one, on Fortin's principle, and requires no correction throughout the scale, but the surface of the mercury in the cistern has become dull, and the liquid might advisably be cleaned. The wet bulb was in a rather dirty condition, the water with which it is supplied containing salts, and the atmosphere of Sheffield being very smoky. I requested that it should be more frequently attended to. This promises to be a valuable station, and the returns will be published when the evening observations are reported.

Penrith, visited July 21st.—The evening observations at Newton Reigny, near Penrith, have been dropped, a fact which is much to be regretted. All the instruments at this excellent station were in

perfect condition, and the observer reads more accurately than any other with whom I am acquainted. His time is much occupied in other business.

York, visited July 23rd.—The returns from this station had not improved in quality since my inspection of 1891. No change has taken place with regard to the position of the sunshine recorder, or in that of any of the other instruments. I still consider that greater accuracy in the reading of the thermometers would be obtained if the two sets of maxima and minima employed for the telegraphic reports and for the 9 o'clock readings respectively were kept in different screens, and this not merely on account of the difficulty of handling the instruments in their present crowded position. The growth of trees at this station, nearly imperceptible in the interval between annual visits, has caused the thermometer screen and the rain-gauges to be more sheltered at the present time than they were in 1879. But I do not at present think it advisable to urge any change in their position.

Tealby (*Market Rasen*), visited November 4th.—The returns from this Second Order station continue to be fairly good, but the observer's avocations prevent punctuality on some occasions; and occasional errors are also noticeable in the barometer reductions. I advised the removal of the rain-gauge to a site near the Stevenson's screen, but no really open place can be found for it. I called on Mr. Jevons, of Market Rasen (who formerly began taking the observations), and asked him to undertake rainfall measurements, if written to, on behalf of the Council. To this he readily assented. Both his rain-gauge and its position are very greatly better than those in the hands of Mr. Lewin. Since my visit Mr. Jevons has begun sending in rainfall returns.

Liverpool, November 24th.—No change of any importance is noticeable since last year in the instruments at this Second Order station. The returns continue to be good.

No corrections are required for the thermometers. Some corrections, which appear to be erroneous, had recently been used by the observers.

Weekly Weather Report Stations.

Ketton Hall (*Stamford*), inspected November 3rd.—At this Weekly Weather Report station I found all the instruments in most satisfactory condition, and, as usual, carefully attended to. The thermometers require no corrections. Mr. Coventry had, since my inspection in 1891, again taken up his residence in Ketton, at a short distance from the Hall. The head gardener at the latter place, however, continues to take the most of the observations.

Stations from which Returns are not at present published.

Epsom, visited June 8th.—My visit to this station was not satisfactory, for although I had in this case sent a notice of it beforehand, Mr. C. I. Gardiner, who was responsible for the observations, was absent, and had left neither his forms for their entry, nor lists of instrumental corrections to be examined, and I could find none of the tables which he employed. The barometer had been removed into the visitors' sitting-room since my visit in 1891, but the level of the cistern was unchanged. Two of the students are accustomed to take the observations, and one of these failed to read the barometer correctly, a fact which probably indicates the source of some of the errors in the returns. The measuring-glass for the rain-gauge I found to be kept in the interior of the gauge; this habit, which I forbade, had probably been the cause of the breakage

during frost of the glass employed in 1891. It is a pity that this station cannot yet be made serviceable.

St. Leonards, inspected June 10th.—Of this station I regret to have to give an unfavourable report. The observer and his family were absent at the date of my visit, and I did not learn who was responsible for those entries of the barometer readings which I find in the returns during the rather prolonged absence of Mr. Colborne. The head gardener at the Gensing Gardens had for a long period taken the readings of the thermometers, the observer being in ill-health. He is an intelligent man, and can read the instruments with a fair amount of accuracy. The hygrometer was in a dirty condition.

Totland Bay, visited June 14th.—The returns from this station are not likely to be of any great value. The observer, Mr. John Dover, is occasionally absent in the summer for a considerable period, during which he lets his house and grounds, and he has no assistant. There is a good set of instruments by Negretti and Zambra. The barometer was compared at Kew in April of 1892, but subsequently a portion of mercury was by an accident abstracted from the cistern. The tube, however, contained no air at the time of my inspection. It has since been sent to the makers to be refilled.

The gusty west winds of the Solent are often strongly felt at this place, as may be inferred from the state of the trees. But the observer greatly over-estimates the force of the wind, and I found several entries of force 12 made in his book during the short time that he had carried on the observations.

Chilworth, June 24th.—The observations at the time of my visit were carried on much as in the previous year, frequent gaps in the returns being noticeable, together with occasional errors due to the absence from time to time of the observer, and to the fact that he had not trained any assistant, while the probability of more prolonged absence from home rendered the likelihood of permanency in the maintenance of the station rather precarious. The barometer, which is well lighted by electricity, was conveniently situated and was well read, but incorrectly reduced, by the observer on the occasion of my inspection. Since my visit the station does not seem to have at all improved.

Seaham, visited July 22nd.—My inspection of this station was this year somewhat disappointing, Mr. Aird being absent during the greater part of the time that I was there. Discrepancies occurred between the readings of the barometer as entered and reported and the same readings corrected and reduced in the month of January 1892, and no explanation of these errors was forthcoming.

The instruments, however, are good and are carefully attended to, while the exposure leaves little to be desired.

St. Helen's, inspected for the first time November 24th.—The observer at this new Second Order Station is Dr. Robertson, M.D., B.Sc., Medical Officer of Health, who undertook to commence returns from January 1st, 1893. I have every reason to anticipate that these returns will prove to be of good quality. The outdoor instruments have a perfect exposure in an open part of the public park. Young trees have been planted near the light iron railings which surround these instruments, but as trees can hardly be said to grow in the atmosphere of this place, those now planted are not likely to produce shelter. White stone has, unfortunately, been laid down under the Stevenson's screen. Distilled water is used for the wet-bulb, which however becomes quickly coated with chemical deposits. The thermo-

meters and rain-gauge were in good order, and the former were correctly read by the observer. The corrections needed for these are at present trivial. A good deal of time having been occupied in finding the observer, it was practically dark when I suspended my standard by the side of the reporting barometer, an Adie's Marine. I found the latter to contain air, the whole of which, as I think, I succeeded in expelling. After the completion, however, of this process, the reporting barometer, corrected for its index error and for the difference of its temperature, the corrections of its attached thermometer being employed, read somewhat lower than my standard, but the light was too bad for absolutely certain accuracy to be attained. The instrument is protected by a glass case, and stands in a shed at the back of one of the greenhouses in the park.

Returns have not yet reached the Meteorological Office from St. Helen's.

Manchester, inspected for the first time on November 25th.—The observations at this promising station are under the direction of the Medical Officer of Health for Manchester, Dr. J. Tatham, who devotes great attention to their supervision. All the instruments are at the observatory on the north-west side of the Oldham Road. This observatory, considering its position in the heart of a great city, occupies a very satisfactory site, the exposure of the outdoor instruments being good, and there being no prospect of the erection of any buildings likely to cause deterioration of this exposure, the ground being the property of the City Council. The equipment is very complete, there being, in addition to the necessary thermometers, a solar radiation thermometer and a grass minimum, also earth thermometers. These were in excellent condition, and the instrumental corrections are trivial. The Jordan's sunshine recorder has a very fair exposure, and it seemed most desirable to publish the records of bright sunshine derived from it, which it has been resolved to do.

Stations wholly or partially Discontinued.

I visited *Leeson*, near Swanage, in June, only to find that the station had just been dropped, which is to be regretted, as the observations promised well. The station of *Leighton Hall*, near Reading, has also, since my visit in June, been discontinued, a fact which I am sorry to have to report, since the locality was a favourable one and the instruments were satisfactory. At *Sudbury*, in Suffolk, Messrs. Ransome have again informed me by letter that they are not disposed to maintain observations necessary for a Second Order station. It is unsatisfactory to find that no station can at present be instituted in this district. At *Sutton Coldfield* the observer, confounding the Meteorological Office with the Royal Meteorological Society, had sent in a record of morning readings of the instruments to the Society. He is too much occupied to take evening observations, and my request made to the Mayor of the town that some clerical assistance should be given to him was not granted. The thermometer screen at this place has been shifted to an improved position.

General Remarks.

I paid especial attention this year to the reports and entries of Mist, as made by different observers, with the unsatisfactory result which was to be anticipated. The observer at Jersey, who reported mist, for some years at all events, more frequently than any other of the observers at

our Telegraphic Reporting stations, informs me that he regards the atmosphere as "misty" when objects at 20 miles distant are invisible in the daytime. On the other hand, some observers in inland localities report mist when objects at two miles' distance are obscured. Between these extremes indefinite variation occurs.

As regards the report or entry "squally," I notice considerable difference in the ideas entertained by observers, inland observers generally tending to regard the weather as squally when its condition would not be thought by seamen, or by those that live upon the coast, to merit the title, the wind being merely gusty or irregular.

A far more important matter is the estimation of wind-force by Beaufort's scale. Observers on the west coasts in these Islands commonly estimate force somewhat lower than those on our eastern coasts, and both of these lower than the observers at inland localities, while I am justified in saying that there is a tendency amongst observers in general to over-estimate wind-force in relation to actual wind velocities.

Remarks on Instruments.

At no station, with the exception of St. Helens, did the barometer contain air.

In none of the minimum thermometers was the column of alcohol found to be broken. At the stations inspected this year an improvement was, generally speaking, noticeable in the condition of the hygrometers.

Stations not inspected.

Of Telegraphic Reporting stations, Jersey, Loughborough, and Spurn Head were, by permission, omitted. The last mentioned station shall be visited in 1893, as soon as the inspection can be undertaken with safety to the instruments. North Foreland was omitted owing to a misunderstanding, and Yarmouth was, I regret to say, left until late in the year, when indisposition prevented my going there.

Of other stations, those in the Isle of Man were omitted by permission, but I must express my regret that I was this year unable to inspect Aysgarth, Stonyhurst, and, still more, Uppingham, which specially required re-visiting.

(Signed) W. Clement Ley.

Name of Station.	Barometer.		Thermometer.									Name of Station.
	Difference of Observers' from Inspector's Readings.	Difference of Check from Reporting Barometer.	Temperature of Water.	Dry Bulb. Correction to reduce to Inspector's Standard.	Wet Bulb. Correction to reduce to Inspector's Standard.	Difference of Wet from Dry Bulb.	State of Hygrometer.	Maximum. Correction to reduce to Inspector's Standard.	Minimum. Correction to reduce to Inspector's Standard.	Spare on Grass. Correction to reduce to Inspector's Standard.	General Condition.	
			°	°	°	°		°	°	°		
Cambridge	+·003	—	58·3	−0·6	−0·6	0·0	A	−0·9	+0·2	—	A	*Cambridge.*
Chilworth	·000	—	62·1	+0·1	0·0	+0·1	A	+0·1	+0·1	—	B	Chilworth.
Dungeness	−·001	−·004	54·4	−0·4	−0·2	−0·2	A	−0·5	−0·5	—	A	*Dungeness.*
Eastbourne	·000	—	59·1	0·0	0·0	0·0	A	0·0	+0·1	—	A	Eastbourne.
Epsom	·000	—	56·7	0·0	+0·1	+0·1	A	+0·1	−0·3	—	B	Epsom.
Hurst Castle	−·002	−·010	57·0	−0·7	−0·1	−0·6	A	−0·3	−0·5	—	A	*Hurst Castle.*
Ketton	—	—	52·7	0·0	−0·1	+0·1	A	−0·1	+0·2	+0·3	A	Ketton.
Liverpool	−·002	+·001	48·2	−0·1	0·0	−0·1	B	−0·2	+0·2	—	A	*Liverpool.*
Manchester	·000	—	46·4	0·0	−0·1	+0·1	B	0·0	+0·1	—	A	Manchester.
North Shields	−·001	−·003	58·2	0·0	+0·2	−0·2	B	+0·1	0·0	−0·3	A	*North Shields.*
Penrith	·000	—	53·8	−0·1	−0·1	0·0	A	−0·1	−0·2	—	A	Penrith.
Plymouth	·000	—	59·6	+0·1	−0·2	+0·3	A	+0·1	−0·1	0·0	A	Plymouth.
Prawle Point	−·001	+·009	55·3	−0·1	−0·7	+0·6	A	−0·1	−0·3	0·0	A	*Prawle Point.*
St. Helen's	·000	—	49·2	−0·2	0·0	−0·2	B	−0·3	+0·2	—	A	St. Helen's.
St. Leonard's	—	—	64·1	−0·8	−0·8	0·0	C	−0·2	−0·2	—	C	St. Leonard's.
Scilly	+·002	+·004	58·0	−0·6	−0·4	−0·2	A	−0·7	−0·1	0·0	A	*Scilly.*
Seaham	+·008	—	55·9	−0·4	−0·4	−0·1	A	−0·2	−0·3	—	A	Seaham.
Sheffield	+·001	—	55·0	−0·1	−0·3	+0·2	B	0·0	−0·1	—	A	Sheffield.
Tealby	−·001	—	49·6	−0·1	−0·1	0·0	A	−0·9	+0·6	−0·2	B	Tealby.
Totland Bay	·000	—	56·5	+0·3	+0·1	+0·2	A	+0·1	+0·3	—	B	Totland Bay.
York	−·002	—	58·9	−0·3	−0·4	+0·1	A	−0·7	+0·2	—	B	*York.*
York	−·002	—	58·9	−0·3	−0·4	+0·1	A	−0·2	+0·2	—	B	York.
Liverpool	−·002	+·001	48·2	−0·1	0·0	+0·1	B	0·0	+0·3	—	A	Liverpool.

The names in *italics* are those of Telegraphic Reporting Stations.

APPENDIX VII.

Method of Dealing with Telegraphic Weather Intelligence.

The operations connected with the preparation and issue of the Forecasts and Storm Warnings have not undergone any material change. Full details will be found in Appendix X. to the Report for 1891.

Daily Weather Report.

No important change has been made during the past year in the Daily Weather Report, a detailed description of which is given in the Annual Report for 1887, and subsequent alterations have been noticed in the more recent Reports. The Report still fills four large quarto pages.

The standing portions (maps, &c.) are printed in blue, while the information for each day is in black.

The subscription for the Report is —

For delivery by hand, where feasible, £2 *per annum;*
Do. by book post £1 „

MS. copies of the observations and remarks can be supplied at the rate of 2*l.* 10*s.* per annum. Arrangements can also be made for the supply of charts drawn from the 8h. a.m. or 6h. p.m. observations, such as appear in the "Times."

The Office receives, when the telegraphic communications are perfect, fifty-eight reports each morning, seventeen each afternoon (except on Sundays), and twenty-nine each evening, the arrangement of which is explained in the Annual Reports for recent years.

The Monthly "Correction and Addition List" is still published.

Weekly Weather Report.

The Weekly Weather Report, which has appeared since February 1878, and was re-arranged at the commencement of 1890, is still prepared for the calendar week, Sunday to Saturday. It is published regularly on Thursdays and is illustrated by three maps for each day. These, like the Daily Reports, show the outline of the land and sea in blue, while the information on them is in black. The maps show (1) for 8 a.m., the temperature, weather, and sea disturbance; and (2) for 8 a.m. and 6 p.m., the distribution of pressure and the winds, over, and on the coasts of, Europe. The information on the first and second pages of each report has been added to, and consists of observations of Temperature and Rainfall made at 79 stations, the individual values for which are given on the second page of the Report, and of Sunshine records taken at 47 stations.

Tables of *Accumulated Temperature* designed to give persons engaged in agriculture better means of estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer, are published on the first and second pages, and show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively, of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard, or *base temperature*. The base value adopted is 42° Fahr.

Accumulated Temperature is expressed in *Day-degrees;* a Day-degree signifying 1° F. of excess or defect of temperature above or below 42° F. continued for 24 hours, or any other number of degrees

for an inversely proportional number of hours. An explanation of the rules by which it is obtained will be found in the Annual Report for 1889, while full details as to the facts on which the rules are founded are published in Appendix II. to the Quarterly Weather Report for 1878.

In addition to the reports from the Telegraphic Reporting Stations, and the returns from the self-recording Observatories, weekly schedules from 56 volunteer observers are used, the names of the stations and observers being given below :—

The MS. of the report is prepared on Tuesday in every week, and the summary on its first page is sent to several papers on that evening; the printed copies of the complete report are ready for sale on Thursday afternoon.

1. Observers furnishing Temperature, Rainfall, and in some cases Bright Sunshine Records.

Names of Stations.	Names of Authorities.
Alnwick Castle	Humphry Willyams, Esq., for the Duke of Northumberland, K.G.
Arlington (N. Devon)	W. Stewart, for Lady Chichester.
Bawtry (Hesley Hall)	B. I. Whitaker, J.P., F.R. Met. Soc.
Blackpool	J. Wolstenholme.
Braemar	J. A. Aitken, J.P.
Brookeborough	Mr. Ferguson, for Sir Douglas Brooke, Bt.
Cheadle	J. C. Philips.
Churchstoke	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester	The Royal Agricultural College.
Cullompton	T. Turner, J.P., F.R. Met. Soc.
Douglas (Isle of Man)	A. W. Moore, M.A., J.P.
Dublin	J. W. Moore, M.D., F.R. Met. Soc.
Durham Observatory	H. J. Carpenter, F.R.A.S.
Edgeworthstown (Currygrane)	J. M. Wilson, J.P.
Fort Augustus	Rev. A. Weld-Blundell, O.S.B.
Fort William	R. T. Omond, F.R.S.E., for Directors of Ben Nevis Observatory.
Foynes	W. Ward, for Lord Monteagle, K.P.
Geldeston	E. T. Dowson, F.R. Met. Soc.
Glencarron	D. D. Munro, for Lord McLaren.
Glenlee	W. Melville, for G. Maxwell.
Hastings (St. Leonard's)	H. Colborne, M.R.C.S.
Hereford	T. A. Chapman, M.D.
Hillington	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Kilkenny	H. Carlton, for the Marquis of Ormonde, K.P.
Killarney	The Ven. Archdeacon Wynne, F.R. Met. Soc.
Lairg	J. Young, Schoolmaster.
Laudale (Loch Sunart)	A. Fletcher, for T. H. G. Newton, M.A., F.R. Met. Soc.
Llandovery	J. Watkins, F.R. Met. Soc.
Llandudno	J. Nicol, M.D., F.R. Met. Soc.
Londonderry	J. Conroy, F.R. Met. Soc.
Marchmont	P. Loney, for Sir Hugh P. Campbell, Bart.,
Markree Castle (Co. Sligo)	A. Marth, F.R.A.S., for Colonel Cooper, F.R.A.S.
Newton Reigny (Penrith)	T. G. Benn, F.R. Met. Soc.
Ochtertyre	G. Croucher, for Sir P. Keith Murray, Bart.
Plymouth	H. N. Dickson, F.R.S.E., and H. V. Prigg, A.M.I.C.E.
Prestwich (Manchester)	Fredk. Gore.
Rothamsted	Rainfall by Sir J. B. Lawes, Bart., LL.D., F.R.S., and Sir J. H. Gilbert, Ph.D., F.R.S.; temperature by T. Wilson, F.R. Met. Soc.

Names of Stations.	Names of Authorities.
Scarborough - - - ℳ	W. Robinson.
Southampton - - -	J. T. Cook, R.E., Ordnance Survey Office.
Stamford (Ketton Hall) - -	Fred. Coventry.
Stowell - - - ℳ	Rev. H. J. Poole, F.R. Met. Soc.
Strathfield Turgiss - - ℳ	Rev. C. H. Griffith.
Waterford (Brook Lodge) - -	C. Percival Bolton, J.P.

The returns marked "ℳ" are supplied through the Royal Meteorological Society, those marked "𝔖" through the Scottish Meteorological Society.

2. OBSERVERS who furnish RECORDS of SUNSHINE only.

Names of Stations.	Authorities.
Edinburgh - - - -	R. C. Mossman, F.R. Met. Soc.
Oswaldkirk - - -	R. Thompson.
Worksop - - - -	H. Mellish, J.P., F.R. Met. Soc.
Thurcaston - - - -	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Margate - - - -	J. Stokes, F.R. Met. Soc.
*Brighton - - - -	A. Newsholme, M.D., F.R. Met. Soc.
Eastbourne - - - -	R. Sheward, F.R. Met. Soc.
*Westbourne - - -	Rev. L. B. Birkett.
*Torquay - - - -	A. Chandler, F.R. Met. Soc.
*Guernsey - - - -	F. E. Carey, M.D., F.R. Met. Soc.
Newquay - - - -	J. Pearce.
*Tenby - - - -	J. E. Gower.
Arley Cottage (Co. Cavan) -	Major Somerset H. Maxwell, F.R.A.S.

* Those marked with an asterisk use Jordan's (Photographic) Recorder; the others use the Stokes-Campbell (Burning) Recorder.

Appendices, &c.

Two Appendices, I. and II., have appeared, similar to those for recent years. The supplement in the form of a Monthly Summary has been improved by the addition to its Tables of Columns showing the difference between the Pressure, Temperature, Rainfall, and Bright Sunshine of the current month, and the means for the corresponding months in a long series of years.

ISSUE of FORECASTS.

There has been little change in this work.

Remarks on the actual state of the weather, and forecasts ***for not more than one day in advance***, are prepared at the Meteorological Office as under :—

*On Week Days.**

(1.) At 11 a.m. (from the morning reports), for the 24 hours ending at Noon on the day following the date of issue. These are intended especially for the early editions of the evening papers, for the clubs, and for exhibition at certain selected stations. See page 9.

* Good Friday and Christmas Day are reckoned as Sundays.

afternoon reports), for the
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m., and 6 p.m. reports),
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gency which may apply for
. A very large number of
s agencies avail themselves

istricts :—

NORTH.
EAST.
.E.
AST.
OUNTIES.
OUTH.
WEST (with Isle of Man)
N.W. (with North Wales).
S.W. (with South Wales).
ORTH.
OUTH.

t the doors of the Meteoro-
eek days,* for the inspection
n, are communicated under
on which is not substantially

front of the Office showing
, and sea disturbance at six
oasts. The stations selected
illy, Holyhead, and Valencia
those for 8 a.m. and 2 p.m.
ng changed at about 9.45h.
easily read from the street.

son can be supplied with a
ch week day,* on payment
m, or 2*s.* 6*d.* per official
he cost of transmission ; the
s., by *book* post, 5*s.* 9*d.*, per

d for any of the hours men-
h daily, on payment of 3*d.*
o the cost of telegraphy.
wn up at 11 a.m., for all the
subscription of ten shillings
o Clubs situated in or near
ade for delivery at a greater

* reckoned as Sundays.

FORECASTS FOR HAY AND CORN HARVESTS, OR FOR PUBLIC USE.—Special facilities are offered for the transmission of Forecasts for these purposes, a nominal fee of 2*s.* 6*d.* being charged for an official quarter or any part thereof, in addition to the cost of the telegrams.

EXHIBITION OF TELEGRAPHIC FORECASTS AT LOCAL POST OFFICES.—The Post Office has sanctioned the exhibition of Forecasts at Local Post Offices, provided space is available, if the persons to whom they are addressed desire them to be so exhibited instead of being delivered.

Unless otherwise arranged, all forecasts transmitted by post are sent by book post, not as letters.

INQUIRIES as to the WEATHER.

INQUIRIES PERSONALLY OR BY MESSENGER.—Any person applying at the Meteorological Office between 11 a.m. and 8 p.m. on week days, and between 7 p.m. and 8 p.m. on Sundays,* can be supplied, in writing, with the latest information in the possession of the Office and with the latest forecast issued for any specified district, on payment of one shilling for each inquiry.

INQUIRIES BY LETTER.—Application may be made by letter, enclosing thirteen pence in stamps if the reply is to be *by post*, and one shilling in stamps, in addition to the cost of the reply (consisting of ten words, exclusive of the address) if the reply is to be *by telegraph*.

INQUIRIES BY TELEGRAPH.—Any person may obtain *by telegraph* from the Meteorological Office the latest information as to the weather in any district of the United Kingdom by payment of a fee of 1*s.* in addition to the cost of a telegram and reply to any post office. The telegram containing the inquiry must be addressed as follows:

To

WEATHER,

LONDON.

The payment for the reply should be for at least ten words in addition to the address.

Application may also be made for similar information to be sent either *by telegraph* or *post* on some future specified day.

CHECKING of FORECASTS and STORM WARNINGS.

The forecasts and storm warnings issued by the Office are carefully checked by being compared with the conditions actually experienced during the time to which they refer. The method adopted was fully explained in the Annual Report for 1891, and the results for 1892 will be found on pp. 10 and 13.

In order to render the information in the possession of the Office as to the weather experienced on our coasts still more complete, the Council have, as in preceding years, made application to the various Light-house Boards, and have obtained from them the original log-books from some of the most exposed lightships and lighthouses. They would again express their cordial thanks for the co-operation so readily granted to them by these Boards.

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* Good Friday and Christmas Day are reckoned as Sundays.

APPENDIX VIII.

REPORT ON THE COMPARISON OF THE FORECASTS ISSUED AT 8h. 30m. p.m. WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1892 to March 1893. The results are for the United Kingdom as a whole.

The letters used have the following signification :—

a = complete success. | **c** = partial failure.
b = partial (more than half) success. | **d** = total failure.

The checking has been conducted on the same system as that employed in previous years, *i.e.*, each forecast has been considered under the separate headings of "Wind" and "Weather," but the results of the 8.30 p.m. Forecasts only are here published.

The first column gives the per-centage of success in "Wind," the second in "Weather," and the third the average of the two.

The Summary for the various districts is given on page 10.

Months.		Per-centages.				Months.		Per-centages.			
		Wind.	Weather.	Average.	a + b.			Wind.	Weather.	Average.	a + b.
April	a	48	62	55	81	October	a	31	59	45	79
	b	28	24	26			b	44	24	34	
	c	15	6	11			c	14	11	13	
	d	9	8	8			d	11	6	8	
May	a	46	66	56	83	November	a	40	53	47	76
	b	33	21	27			b	34	25	29	
	c	14	9	12			c	19	14	17	
	d	7	4	5			d	7	8	7	
June	a	43	47	45	77	December	a	31	54	43	76
	b	31	32	32			b	39	28	33	
	c	18	15	16			c	23	12	18	
	d	8	6	7			d	7	6	6	
July	a	50	62	56	85	January	a	28	45	37	77
	b	31	27	29			b	42	39	40	
	c	12	6	9			c	25	8	17	
	d	7	5	6			d	5	8	6	
August	a	42	45	44	81	February	a	24	48	36	71
	b	40	35	37			b	38	32	35	
	c	12	14	13			c	26	14	20	
	d	6	6	6			d	12	6	9	
September	a	31	49	40	74	March	a	34	53	44	81
	b	34	38	34			b	43	32	37	
	c	25	11	18			c	15	9	12	
	d	10	7	8			d	8	6	7	

(*continued.*)

continued from p. 65.)

		Per-centages.			
		Wind.	Weather.	Average.	a + b.
The entire year	a	37	54	46	79
	b	37	29	33	
	c	18	11	14	
	d	8	6	7	

APPENDIX IX.

Telegraphic Weather Intelligence.

The Meteorological Office issues notices of atmospherical disturbances on or near the coasts of the British Islands (free of charge) to ports and fishing stations recommended by responsible local authorities.

The fact that one of these notices has been received at any station, is made known by hoisting a cone 3 feet high and 3 feet wide at base, which has the appearance of a triangle when hoisted. The telegram directing the cone to be hoisted should be exhibited near the signal staff.

At dusk, whenever a signal ought to be flying if it were daylight, a night signal consisting of three lanterns hung on a triangular frame, may be hoisted in place of the cone.

The Meteorological Office supplies the canvas cone, but does not undertake to supply the lanterns. In all cases the local authorities must undertake the charges incidental to the hoisting of the signal, such as flagstaff and gear, oil, &c., and also as to the keeping of the apparatus in repair, painting, &c.

The following is a list of the stations at which the signals are hoisted. They are situated, 100 in England and Wales, 47 in Scotland, 20 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands :—

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.E.	IRELAND, S.W.	ENGLAND, S.W.	ENGLAND, E.
Lerwick.	New Ross.	Scilly.	Harwich.
Scalloway.	Dunmore East.	St. Just.	Ipswich.
Dunrossness.	Dungarvan.	St. Sennen.	Southwold.
Stromness.	Youghal.	Penzance.	Yarmouth.
Kirkwall.	Queenstown.	Newlyn, West.	Cromer.
Holborn Head.	Passage.	The Lizard.	Sheringham.
Dunnet Head.	Cork.	Falmouth.	Lynn.
Wick.	Kinsale.	Pendennis.	Sutton Bridge.
Avoch.	Do. (Old Head).	Mevagissey.	
Inverness.	Brow Head.	Plymouth.	
Nairn.	Tralee.	Devonport.	
Burghead.	Limerick.	Prawle Point.	
Lossiemouth.	Galway.	Teignmouth.	
Buckie.		Exmouth.	
Port Knockie.			
Cullen.			
Portsoy.	IRELAND, N.W.		
Banff.			
Fraserburgh.	Malin Head.		
Peterhead.	Portrush.		ENGLAND, N.E.
Aberdeen.	Port Ballintrae.	ENGLAND, S.	Boston.
		Guernsey.	Cleethorpes.
		St. Helier's (Jersey).	Grimsby.
	IRISH SEA.	Gorey (Jersey).	Goole.
	Belfast.	Weymouth.	Hull.
SCOTLAND, E.	Donaghadee.	Poole.	BridlingtonQuay.
Stonehaven.	Howth.	Cowes.	Flamborough Head.
Montrose.	Kingstown.	Ryde.	Filey.
Broughty Ferry.	Ramsey (I. of M.).	St. Catherine's Point.	Whitby.
Dundee.	Douglas „	Portsmouth.	Redcar.
St. Andrews.	Castletown „	Southampton.	Middlesborough.
Anstruther.	Silloth.	Littlehampton.	West Hartlepool.
Pittenweem.	Maryport.	Brighton.	Sunderland.
Burntisland.	Workington.	Newhaven.	South Shields.
Grangemouth.	Whitehaven.		Tynemouth.
Bo'ness.	Barrow.		Berwick - on - Tweed.
Granton.	Morecambe.		
Newhaven.	Fleetwood.		
Leith.	Blackpool.		
Fisherrow.	Lytham.		
Dunbar.	Preston.		
Cockburnspath.	Southport.		
St. Abb's Head.	Liverpool.		
Eyemouth.	Runcorn.	ENGLAND, S.E.	
	Connah's Quay.	Hastings.	
	Penmaenmawr.	Rye.	
	Port Penrhyn.	Sandgate.	
	Port Dinorwic.	Folkestone.	
	Carnarvon.	Dover.	
	Holyhead.	Ramsgate.	
		North Foreland.	
		Margate.	
	ST. GEORGE'S CHANNEL.	Faversham.	
		Sheerness.	
	Aberystwith.	Chatham.	
	Milford.		

[*continued.*

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.W.	BRISTOL CHANNEL.		
Stornoway.	Pembrey.		
Port of Ness (Island of Lewis).	Llanelly.		
	Swansea.		
	Briton Ferry		
	Porthcawl.		
	Penarth.		
	Cardiff.		
	Do. Barry Dock.		
SCOTLAND, W.	Newport.		
	Weston-super-Mare.		
Glasgow.	Burnham.		
Greenock.	Bridgewater.		
Rothesay.	Ilfracombe.		
Campbelton.	Barnstaple.		
Girvan.	Appledore.		
Ballantrae.	Boscastle.		
	Port Isaac.		
	Newquay.		
	Hayle.		
	St. Ives.		

APPENDIX X.

Fishery Barometers.

List of Places supplied with Fishery Barometers.

Shetland Isles.—Balta Sound, Uya Sound, Burravoe, Nesting, Lerwick, Sandsair, Scalloway, Symbister.

Orkney Isles.—Westray, Papa, Burray, Kirkwall.

Scotland, east coast.—Duncansbay, Freswick, Auchengill, Keiss, Staxigoe, Wick, Lybster, Dunbeath, Portmahomack, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy, Whitehills, Gardenstown, Rosehearty, Pitullie, Fraserburgh, Inverallochy, Pointlaw, Findon, Portlethen, Skateraw, Stonehaven, Arbroath, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance, Burntisland, Newhaven.

England, east coast.—Berwick, North Shields, South Shields, Sunderland, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn (2), Wells, Gorleston, Lowestoft, Orford Haven, Woodbridge Haven, Harwich, Brightlingsea, West Mersea, Margate, Deal, Kingsdown, Dover.

England, south coast.—Bognor, Ryde, Bembridge, Brixton, Atherfield, Ventnor, Gorey (Jersey), Haslar Hospital, Poole, Weymouth, Portland, Budleigh Salterton, Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscath, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn (2), Mousehole.

England, south-west coast.—St. Ives, Hayle, Port Isaac, Boscastle, Bideford, Burnham, Highbridge, Weston-super-Mare.

Wales.—Briton Ferry, Swansea, Angle, Milford, Nevin, Carnarvon.

England, north-west coast.—Fleetwood, Morecambe, Maryport.

Isle of Man.—Douglas, Port St. Mary, Peel (2).

Scotland, south-west coast.—Port Patrick, Stranraer.

Ireland, east coast.—Cushendall, Belfast, Bangor, Groomsport, Donaghadee, Ardglass, Warren Point, Carlingford, Greenore, Dundalk, Malahide, Howth, Kingstown (2), Bray, Wicklow.

Ireland, south coast.—Dunmore East, Dungarvan, Crosshaven, Kinsale, Union Hall, Castletownsend, Baltimore, Schull (2), Crookhaven.

Ireland, west coast.—Valencia, Dingle, Tralee, Tarbert, Kilcredane Kilronan, Spiddal, Cleggan, Elly Bay, Ballyglass, Ballycastle (Co. Mayo) Donegal, Tribane, Killybegs, Teelin, Portnoo, Burton Port, Kincaslagh, Bunbeg.

Ireland, north coast.—Dunfanaghy, Rathmullen, Buncrana, Malin Head, Moville, Greencastle, Portstewart, Portrush, Ballycastle (Co. Antrim).

Scotland, west coast.—Tarbert (Loch Fyne), Campbeltown, Carradale, Portree, Armadale (Isle of Skye), Plockton, Gruinard, Ullapool, East Mey, Stroma.

Hebrides.—Stornoway, Portnaguiran, Obb, Valtos, Carloway, Ness.

Summary of Stations supplied with Instruments.

England and Wales - - - - -	69
Scotland and Isle of Man - - - -	69
Ireland - - - - - -	54
	192

APPENDIX XI.

LIST of STATIONS from which CONTINUOUS RECORDS of BRIGHT SUNSHINE have been received.

Station.	Observer.
Aberdeen Observatory	Prof. C. Niven, M.A., F.R.S.
Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S.
Blackpool	J. Wolstenholme.
Cambridge	H. Todd and P. Morris.
Churchstoke	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester	Prof. Ohm, B.A., F.R. Met. Soc.
Cronkbourne, Isle of Man	A. W. Moore, M.A., J.P.
Cullompton	Thos. Turner, J.P., F.R. Met. Soc.
Deerness (Orkney)	M. Spence.
Dublin, Mountjoy Observatory	Lt.-Col. Kirkwood, R.E.
Durham	H. J. Carpenter, F.R.A.S.
Eastbourne	R. Sheward, F.R. Met. Soc.
Edinburgh	R. C. Mossman, F.R. Met. Soc.
Falmouth Observatory	E. Kitto, F.R. Met. Soc.; for the R. Cornwall Polytechnic Soc.
Fort Augustus	Rev. M. Wall, O.S.B.
Fort William	R. T. Omond, F.R.S.E.; for the Directors Ben Nevis Observatory.
Geldeston, Beccles	E. T. Dowson, F.R. Met. Soc.
Glasgow	The late Prof. R. Grant, M.A., LL.D., F.R.S.; and Prof. L. Becker, Ph.D.
Harpenden	Sir J. H. Gilbert, Ph.D., F.R.S.
Hastings	H. Colborne, M.R.C.S.
Hillington	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Jersey (St. Helier's)	Capt. Bichard, Harbour Master.
Kew Observatory	The late G. M. Whipple, B.Sc., F.R.A.S., and T. Baker, F.R. Met. Soc.; for the Kew Committee.
Leicester (Thurcaston)	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Llandudno	J. Nicol, M.D., J.P., F.R. Met. Soc.
London, Bunhill Row	Messrs. de la Rue.
„ Westminster	The Staff, Meteorological Office.
Marchmont	P. Loney; for Sir Hugh P. Campbell, Bt.
Margate	J. Stokes, F.R. Met. Soc.
Markree Castle	A. Marth, F.R.A.S.; for Col. E. H. Cooper, F.R.A.S.
Newquay (Cornwall)	J. Pearce.
Newton Reigny (Penrith)	T. G. Benn, F.R. Met. Soc.
Oswaldkirk, Yorkshire	R. Thompson.
Oxford	E. J. Stone, M.A., F.R.S.
Parsonstown	O. Boeddicker, Ph.D.; for the Earl of Rosse, K.P., F.R.S.
Plymouth	H. N. Dickson, F.R. Met. Soc., and H. Victor Prigg, A.M.I.C.E.
St. Ann's Head	S. Blake, Principal Lightkeeper.
Southampton	Sir C. Wilson, Col., R.E., K.C.B., F.R.S.
Stonyhurst	Rev. W. Sidgreaves, S.J.
Stornoway	John Forbes.
Sutton Coldfield	C. F. Marston, C.E.
Valencia	J. E. Cullum, F.R. Met. Soc.
Worksop	H. Mellish, J.P., F.R. Met. Soc.
York	J. E. Clarke, B.A., B.Sc.
Georgetown, British Guiana	G. S. Jenman.

In addition, the number of hours of sunshine recorded each day is reported from the following Stations :—

Arley Cottage (Co. Cavan) -	- Major Somerset H. Maxwell, F.R.A.S.
Braemar - - -	- James Aitken, J.P.
Brighton - - -	- A. Newsholme, M.D., F.R. Met. Soc.
Guernsey - - -	- F. E. Carey, M.D., F.R. Met. Soc.
Tenby - - -	- J. E. Gower.
Torquay - - -	- Alfred Chandler, F.R. Met. Soc.
Westbourne (Sussex) -	- Rev. L. B. Birkett.

APPENDIX XII.

METHODS FOLLOWED IN DEALING WITH METEOROLOGICAL RETURNS FROM LAND STATIONS IN THE BRITISH ISLES.

These stations are of five classes, as stated on page 14.

I.—*Observatories continuously observing all the Meteorological Elements.*

Returns from observatories.

Hourly measurements of the curves obtained from the self-recording instruments at the observatories of the Office are made by the observers at each station, on printed forms supplied for the purpose, which, together with the curves, are forwarded to the Office weekly. They comprise measurements of the barograms, of the dry bulb and wet-bulb thermograms, of the anemograms, and of the rain-gauge curves.

Examination of returns.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the revised regulations which have been adopted to secure this end will be found in the Report of the Office for 1890. They comprise rules for the guidance of observers, as well as of the assistants charged with the examination of the work at the Office. Attention need be called here to only two of these rules, viz., (*a*) the use of subsidiary sheets on which are entered the results of a second set of measurements of the curves made after, and quite independently of, the first set, and with a different form of scale, the two sets of measurements being afterwards compared together, and any differences found inquired into and set right; and (*b*) the re-measurements of the curve made by the assistants at the Meteorological Office, and which always amount to 40, and in doubtful cases to many more, per month, for each element.

Results of examination and report to Council.

The attention of the observers is always drawn to such errors as may be detected, and to any failures in the continuity of the curves arising from failure of the light, stoppage of the clock, defective photography, faulty action of the wet-bulb thermometer, &c.; a report containing the results of the examination of each Observatory being also submitted to the Council periodically. The curves and tabulations are eventually bound and stored in the Office.

General supervision of observatory work.

In connexion with this work should be mentioned the general watch which has to be kept over the working of the observatories and of the instruments, not only to secure uniformity amongst them and observance of rules, but also to guard against small changes which are liable to occur at certain times, especially with the thermographs, and which may affect the scale-values of the instrument or the datum lines used for the tabulation of the curves. About twice a year this work calls for special examination, entailing some considerable time and occasionally the engraving of new scales for measuring the curves.

METHOD OF DEALING WITH THE NUMERICAL RESULTS FROM THE SELF-RECORDING OBSERVATORIES.

Interpolations.

In dealing with the tabulations the first step is to go over the sheets and fill up by interpolation, wherever possible, any gaps or breaks in the continuity of the record.

The records having been made as complete as possible, are then used for the calculation of daily and hourly mean values, for periods of five days, calendar months, and for the year; which, together with other data obtained from the same source, are published under the title of "Hourly Means of the Readings obtained from the Self-recording "Instruments at the Four Observatories under the Meteorological

"Council." The volumes for 1889 and 1890 have been issued during the year, and some progress has been made with the calculations for the year 1891.

II.—*Anemographic Stations at which the Wind is recorded continuously.*

The anemograms received from the stations enumerated on page 75 are regularly examined and tabulated in the Office, and the sheets bound up in volumes. Besides special inquiries on legal and other points that from time to time arise, and in which these documents are of high importance, the tabulations are always employed in the preparation of the various Reports issued by the Office. They are also regularly used in the checking of the Storm Warnings.

III.—*Land Stations of the Second Order.*

Origin and progress of system.

Ever since the year 1866 returns of more or less completeness have been received from land stations in the United Kingdom. In that year there was only one station, but by 1871 the number had increased to 15, and five years later to 49, including 14 stations belonging to the Royal Meteorological Society, copies of the returns from which were sent to the Office under a special arrangement with the Society.

At the end of March 1892 the total number of stations was 103, including 17 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society.

It must, however, be observed that while this number is exclusive of the self-recording observatories and of the anemographic stations, it includes several others from which only very scanty information is received.

The stations are distributed as follows: 45 in England, 4 in Wales, 28 in Scotland, and 26 in Ireland.

The methods followed with regard to the examination and publishing of these returns have been fully detailed in previous reports, and need not now be repeated. The changes introduced into the volume for 1886 have been continued in those for later years. These refer to the barometer readings, which are now given at station-level instead of being reduced to the mean sea-level; and to the humidity, where the depression of wet-bulb is shown, the international forms A and B being modified accordingly.

The volume for 1889 contains returns from 65 stations.

Arrangements have been made under which it is hoped that the arrears of this publication will be rapidly reduced.

Reports from the Irish stations are regularly supplied to the Registrar-General for Ireland for his Weekly and Quarterly Returns.

New stations.

When an application for the adoption of a new station is received, a schedule is forwarded to the observer containing a series of questions as to the outfit of the station, the exposure of the instruments, and the influence likely to be exerted on their indications by surrounding objects, such as houses and trees. Only mercurial barometers are accepted, and only such as have been duly verified. All thermometers must have been tested at Kew. A plan of the station, showing the positions of the instruments with regard to neighbouring objects, is also required.

On the return of this schedule the answers are considered, and, where necessary, alterations are advised.

If, however, the existing arrangements are satisfactory, tables for reducing the barometer readings to 32° Fahrenheit at mean sea-level are prepared and duplicates sent to the observer, together with a set of Hygrometrical Tables, and a copy of "Instructions in the Use of Meteorological Instruments."

The first returns are compared and examined with special care, and a report of the result of the examination is forwarded to the observer, with instructions how best to improve and complete the returns.

There are still many parts of the British Islands very poorly represented by the existing stations, and any information for these districts would be valuable.

Sunshine records.

The daily records of sunshine which are now received from 51 Stations in the British Islands are examined generally, to guard against accidental changes in the adjustment of the instruments. Notes explaining any omission or accidental defect are added to the cards if required, and after their receipt has been acknowledged, they are duly stamped and dated and then stored in the Office.

Weekly totals.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VIII., and for those stations which are also Stations of the Second Order the monthly totals of bright sunshine in hours, together with the per-centages of its possible duration, are published as Part IV. of "Returns from Stations of the Second Order." A table showing the daily amount of sunshine at Bunhill Row, one of the London stations, is also prepared quarterly for the Royal Meteorological Society.

Inspection.

The Stations of the Second Order are regularly inspected, the attention of the inspector being directed by the Office to any special point which may require investigation.

IV.—*Telegraphic Reporting Stations.*

Full particulars relating to these stations, the information received from them, and the method of dealing with that information, will be found in Appendix VII. to the Report for the year 1888-9. A paragraph in that Appendix (p. 60) explains the use that is made of the monthly schedules sent in by the observers.

V.—*Extra Stations.*

The returns from Stations of the Fifth Class are not regularly published by the Office, but they are available for any special investigation that may be taken up. The rainfall values at these stations are, however, copied and supplied to Mr. Symons, F.R.S., for publication in "British Rainfall."

APPENDIX XIII.

List of Documents relating to the Land Meteorology of the British Islands, received during the Year ending March 31st, 1893.

Stations.	Observers.	Nature of Information received.	Notes.
Class I. Valencia	J. E. Cullum, F.R. Met. Soc.	Continuous records of pressure, temperature, wind, sunshine, and rain, with eye observations of the clouds and notes on the weather.	
Aberdeen	Prof. C. Niven, M.A., F.R.S.		
Falmouth	E. Kitto, F.R. Met. Soc.		
Kew	The late G. M. Whipple, B.Sc., F.R.A.S., F.R. Met. Soc.		
Fort William	R. T. Omond, F.R.S.E.	- - - - - -	Except wind.
Glasgow	The late Prof. R. Grant, M.A., LL.D., F.R.S., and Prof. L. Becker, Ph.D.	Continuous records of pressure, temperature, wind, sunshine, and rain.	
Stonyhurst	Rev. W. Sidgreaves, S.J.		
Class II. †Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S.	Continuous record of wind, rainfall, and sunshine.	
Alnwick Castle	Humphry Willyams, Esq., for the Duke of Northumberland, K.G.	Continuous record of wind (direction and velocity).	
†Dublin (Phœnix Park)	Lt.-Col. Kirkwood, R.E.	„ „	
Fleetwood	M. S. Gaulter, C.E.	„ „	
†Holyhead	Hugh Williams, C.E.	„ „	
North Shields	Capt. W. Harrison	„ „	
Scilly	A. Hicks	„ „	
†Deerness (Orkney)	M. Spence	„ „	
Yarmouth	G. T. Watson	„ „	
†Kilkenny Castle	The Marquis of Ormonde, K.P.	Continuous record of pressure.	
London	The Athenæum Club	„ „	
Penbedw (Mold)	H. W. Buddiwm	„ „	
Plymouth	H. N. Dickson, F.R.S.E.	„ „ - - -	Till June 1892.
†Waterford	The Harbour Authorities	„ „	

College).			
Geldeston (Beccles) -	E. T. Dowson, F.R. Met. Soc. - -		
†Glasgow - -	The late Prof. R. Grant, M.A., LL.D., F.R.S., and Prof. L. Becker, Ph.D.		
Heysham Hall (Lancs.)	S. Lomas for Miss Grafton - - -	- - - - - -	From February 1893.
Hillington, Norfolk -	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc. -		
†Ladylaw, Hawick -	W. R. Wilson - - - - -		
Laudale (Argyleshire)	A. Fletcher, for T. H. G. Newton, M.A., J.P.		
†Liverpool - -	W. E. Plummer, F.R.A.S., and Fredk. Skinner		
†Londonderry - -	J. Conroy, F.R. Met. Soc. - - -		
Margate - -	J. Stokes, F.R. Met. Soc. - - -		

Southampton -	J. T. Cook, for Dir. Gen. of Ordnance Survey	
Stokesay - -	Miss M. A. Digges La Touche - -	
Stonyhurst - -	Rev. W. Sidgreaves, S.J. - - -	
†Tealby (Lincolnshire)	Rev. S. Lewin - - - -	
Uppingham - -	Rev. G. H. Mullins, M.A. - - -	
†Wolfelee (Roxburghshire).	M. W. Cockburn, for Sir W. Elliott, K.S.I. -	
†York - - -	J. Wright, for Yorkshire Phil. Soc. - -	

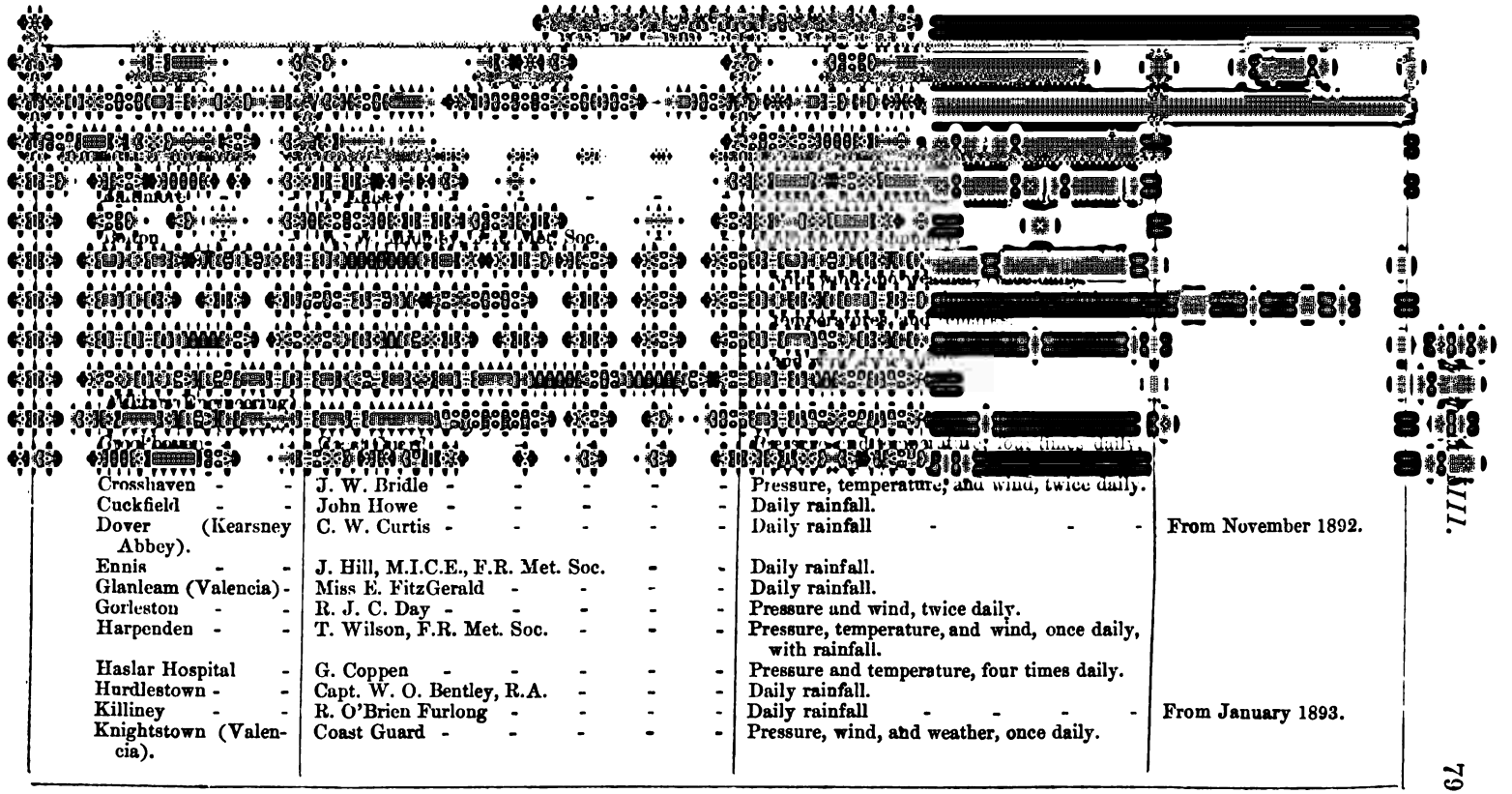
CLASS IIIa.

Bennington, Herts -	Rev. J. Dunne Parker, LL.D., F.R. Met. Soc.-	Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m. each day as above.
Berkhamsted -	E. Mawley, F.R.H.S., F.R. Met. Soc. - -	
†Buxton - -	E. J. Sykes, M.B., F.R.A.S., F.R. Met. Soc. -	
Callton Mor - -	J. Russell, for J. Malcolm of Poltalloch, M.P.	

LIST OF DOCUMENTS—*continued.*

Stations.	Observers.	Nature of Information received.	Notes.
⚓ Cargen (Dumfries) -	P. Dudgeon, F.R.S.E., and Alex. Peacock -	Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m. each day as above.	
Ⓜ Cheadle - -	J. C. Philips - - - -		
Ⓜ†Cheltenham - -	R. Tyrer, B.A., F.R. Met. Soc. - -		
Ⓜ†Churchstoke - -	P. Wright, F.C.S., F.R. Met. Soc. - -		
Ⓜ Cramlington - -	W. Bonal - - - -		
Ⓜ†Dartmoor - -	F. W. S. Stone, M.B. - - - -		
⚓†Fort Augustus -	Rev. A. Weld-Blundell, O.S.B. - -		
⚓ Fort William - -	R. T. Omond, F.R.S.E., for Directors of Ben Nevis Observatory.		
⚓†Glencarron - -	D. D. Munro, for Lord McLaren - -		
⚓ Glenlee (Kirkcudbrightshire).	W. Melville, for George Maxwell - -		
⚓†Gordon Castle -	J. Webster, for the Duke of Richmond, K.G. -		
Ⓜ†Killarney - -	The Ven. Archdeacon G. R. Wynne, M.A., F.R. Met. Soc.		
⚓†Lairg - -	J. Young, for the Duke of Sutherland -		
⚓†Lednathie (Forfarshire).	W. Morrison, for Stormonth Darling, Q.C. -		
⚓†Lissan (Co. Tyrone) -	Sir Nathaniel Staples, Bart. - - -		
Ⓜ†Llandudno - -	J. Nicol, M.D., F.R. Met. Soc. - -		
⚓†Marchmont - -	Peter Loney, for Sir Hugh P. Campbell, Bt. -		
⚓ Ochtertyre - -	G. Croucher, for Sir Patrick Keith Murray, Bt.		
⚓ Pinmore - -	Peter Donald, for Capt. Hamilton - -		
⚓†Rosewell - -	R. W. D. Cameron, M.D. - - -		
⚓ Rothesay (Isle of Bute)	James Kay - - - - -		
Ⓜ†Rousdon - -	C. E. Peek, M.A., F.R.A.S., F.R. Met. Soc. -		
Ⓜ Wakefield - -	H. Clarke, L.R.C.P., F.S.S., F.R. Met. Soc. -		

CLASS IV. The Telegraphic Stations, see List on page 45.



Crosshaven - -	J. W. Bridle - - - - -	Pressure, temperature, and wind, twice daily.	
Cuckfield - -	John Howe - - - - -	Daily rainfall.	
Dover (Kearsney Abbey).	C. W. Curtis - - - - -	Daily rainfall - - -	From November 1892.
Ennis - -	J. Hill, M.I.C.E., F.R. Met. Soc. - -	Daily rainfall.	
Glanleam (Valencia) -	Miss E. FitzGerald - - - -	Daily rainfall.	
Gorleston - -	R. J. C. Day - - - - -	Pressure and wind, twice daily.	
Harpenden - -	T. Wilson, F.R. Met. Soc. - - -	Pressure, temperature, and wind, once daily, with rainfall.	
Haslar Hospital -	G. Coppen - - - - -	Pressure and temperature, four times daily.	
Hurdlestown - -	Capt. W. O. Bentley, R.A. - - -	Daily rainfall.	
Killiney - -	R. O'Brien Furlong - - - -	Daily rainfall - - - -	From January 1893.
Knightstown (Valencia).	Coast Guard - - - - -	Pressure, wind, and weather, once daily.	

Sudbury - -	W. Bayley Ransome - - - -	Pressure, temperature (dry-bulb, max., min.), wind, cloud, and rainfall, once daily, with general remarks.
Swineshead (Boston)	J. H. Brown - - - - -	Daily rainfall.
Symbister, Shetland -	J. S. Nicolson - - - -	Pressure and temperature, twice daily.
†Totland Bay - -	John Dover, B.A., F.R. Met. Soc. - -	Full return for 9 a.m.
Union Hall (Glandore)	Coast Guard - - - - -	Pressure, temperature, and wind, twice daily.
Westray (Orkney) -	Capt. J. Hewison - - - -	Pressure, temperature, and wind, twice daily.

Notes.—In addition to the above a daily record of observations made at the Royal Observatory, Greenwich, is kindly supplied by the Astronomer Royal. The Stations marked "[illegible]" belong to the Royal Meteorological Society; those marked "[illegible]" belong to the Scottish Meteorological Society. Those marked thus † have been inspected during the year.

Meteorological Council.

APPENDIX XIV.

LIST of STATIONS from which SEA TEMPERATURE RETURNS have been received during 1892-93.

English Coastguard Stations.

Newquay.
Salcombe.
Scarborough.
Sunderland.

English Light Vessels.

Bahama Bank.
Caernarvon Bay.
Cardigan Bay.
East Goodwin.
English and Welsh Grounds.
Leman and Ower.
Liverpool, North-west.
Newarp.
Outer Dowsing.
Owers.
Royal Sovereign.
Seven Stones.
Shambles.
Shipwash. (Oct. 1892 to March 1893 only.)
Solway.
Spurn.

Irish Coastguard Stations.

Ballydonegan. (Cork.)
Ballyglass, Broad Haven. (Mayo.)
Blacksod Point. (Mayo.)
Cleggan. (Galway.)
Kilcredane. (Clare.)
Minard. (Kerry.)
North Arran. (Galway.)
Portrush. (Antrim.)
Seafield. (Clare.)
Sheephaven, Dunfanaghy. (Donegal.)
Teelin. (Donegal.)

Irish Light Vessels.

Coningbeg.
Daunt's Rock.
Kish Bank.
South Rock.

Scotch Coastguard Stations,

Ballantrae.
Burnmouth.
Burntisland.
Cove Bay, Aberdeen.
Cromarty.
Kirkwall.
Lamlash.
Lerwick.
Pennant Bay, Aberdour.
Stornoway.
Uzon, Montrose.
Wick.

APPENDIX XV.

Accessions to the Library during the Year ending 31st March 1893.

* **(Abbe, C.)**—Atmospheric radiation of heat and its importance in meteorology. la. 8°. (*Amer. Journ. Sc., 3rd ser.*, xliii., 1892, *p.* 364.)

‖ ——— Cloud observations at sea. la. 8°. (*Amer. Meteor. Journ.*, 1891, *Oct., p.* 250.)

‖ ——— Memoir of William Ferrel. 1817–1891. Read before the Nat. Acad., Apl., 1892. (? *Rep. Nat. Acad. Sc.*, 1892, *p.* 265.)

‖ **Adams, W. G.**—Comparison of simultaneous magnetic disturbances at several observatories. Read June 18, 1891. la. 4°. London, 1892. (*Phil. Trans.*, clxxxiii., 1892, *A., p.* 131.)

Adelaide Observatory.—Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the Northern Territory, during the year 1890, under the direction of C. Todd. sm. f°. Adelaide, 1892.

[———] Rainfall in South Australia and the Northern Territory during 1889 and 1891; with weather characteristics of each month. By C. Todd. 2 vols. f°. Adelaide, 1891–92.

‖ **Aitken, John.**—On some phenomena connected with cloudy condensation. 8°. (*Proc. R. Soc.*, li., 1892, *p.* 408.)

* **Aldrich, H. L.**—Arctic Alaska and Siberia, or, eight months with the Arctic whalemen. sm. 8°. Chicago and New York, 1889.

[Algiers, Service Météorologique du Gouvernement Général de l'Algérie.]—Bulletin météorologique de l'Algérie. 1892, Jan. 1—Dec. 31. sm. f°. Sheets.

[Allahabad, Meteorological Office.]—Brief sketch of the meteorology of the North-Western Provinces and Oudh and adjacent parts of Rajputana and the Panjab for the year 1891. sm. f°. s.l.e.a.

American Meteorological Journal.—A monthly review of meteorology. Vols. viii.–ix., 1891–1893. 2 vols. la. 8°. Ann Arbor and Boston, s.a.

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.—Nomina geographica Neerlandica. Geschiedkundig onderzoek der nederlandsche aardrijkskundige namen, . . . iide Deel. la. 8°. Leiden, 1892.

——— ——— Tijdschrift . . . onder redactie van C. M. Kan en J. Æ. C. A. Timmerman. Tweede serie. Deel ix. 2 vols. 8°. Leiden, 1892.

André, C.—Contribution à l'étude de l'électricité atmosphérique. 4°. [*Compt. rend. acad. sc., Paris*, cxii., 1891, *p.* 1509.]

——— Relations des phénomènes météorologiques déduites de leurs variations diurnes et annuelles. la. 8°. Lyon, 1892.

‖ **Andrews, T.**—Address on ozone. la. 8°. Edinburgh, 1874. (*Journ. Scott. Meteor. Soc.*, iv. 1876, *p.* 122.)

* **Anglo-American.**—In the United States Weather Office. 4°. (*Cassell's Family Mag.*, 1893, *Jan., p.* 92.)

Antigua, Government Laboratory. — Meteorological record for 1892. Suppl. to the Leeward Islands Gazette, 16 Feb. 1893. la. 8°.

Australia. — [Rainfall and meteorological observations in the Australian Colonies, 1884 and 1888–1889.] 2 parts. 8°. (*Year Book of Australia*, 1886, *p.* 63; 1890, *p.* 59.)

Azambuja, G. A. de.—Annuario do Estado do Rio Grande do Sul para o anno de 1893. Anno ix. sm. 8°. Porto Alegre, 1892.

* **Ball, E. A. R.**—Mediterranean winter resorts: a practical handbook to the principal health and pleasure resorts on the shores of the Mediterranean. sm. 8°. London, 1888.

Note.—Books marked * have been acquired by purchase; the others are donations from institutions, societies, or authors. Those marked ‖ are excerpt papers, extra copies of which have been separately printed.

In some cases additional publications have been received besides those specified, but only completed volumes or years are given here.

* **(Ball, Sir R. S.)**—The recent heat-wave. 1a. 8°. (*Contemp. Rev.*, 1892, *Oct.*, *p.* 478.)

|| **Ballou, S. M.**—The eye of the storm. Papers from the Laboratory of Phys. Geogr. of Harvard Coll., No. 6. 1a. 8°. Boston, 1892. (*Amer. Meteor. Journ.*, ix., *Nos.* 2 *and* 3.)

Batavia, Magnetical and Meteorological Observatory.—Observations . . . Published under the direction of J. P. Van der Stok. Vols. xiii.–xiv. 1891–1892. 2 vols. f°. Batavia, 1891–92.

——— **Observatorium.**—Regenwaarnemingen in Nederlandsch—Indië. xii.–xiii. Jahrg. 1890–91. Door J. P. Van der Stok. 2 vols. 8°. Batavia, 1391–92.

* **Bateman, T.**—Reports on the diseases of London, and the state of the weather, from 1804 to 1816; . . . 8°. London, 1819.

|| **Baxendell, J.**—Abstract of meteorological results for the Borough of Southport. Averages for the 20 years, 1872–91, inclusive. 18°. Slip. (*Southport Corporation Year Book for* 1892–93.)

——— Abstracts of observations at the Southport meteorological observatory for the weeks ending Jan. 8 to Dec. 30, 1892. Slips.

Belize.—Summary of meteorological observations at St. Joseph's Observatory during the months of Jan.—Dec. 1892. 4°. Sheets. (*The Angelus, Belize*, 1892–93.)

* **Belville, J. H.**—A manual of the barometer; . . . . . also a description of the aneroid barometer. 3rd ed. sm. 8°. London, 1858.

Benn, T. G.—Observations in meteorology . . eing the result of a meteorological register kept for ten years (1883–1892) at Newton Reigny, Cumberland. 8°. Penrith, [1893].

* **Berghaus, H.**—Atlas der Geologie. Berghaus' Physikalischer Atlas, Abteilung i. Unter beratender Mitwirkung von K. v. Zittel bearbeitet von H. Berghaus. f°. Gotha, 1892.

Berlin, Königlich Preussisches meteorologisches Institut.—Ergebnisse der meteorologischen Beobachtungen im Jahre 1889. 1a. 4°. Berlin, 1892.

|| ——— ——— Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1892, Jan.–Dec. 1a. 4°. (*Statist. Korresp.*)

|| **Bezold, W. von.**—Die Meteorologie als Physik der Atmosphäre. 1a. 8°. Berlin, 1892. (*Himmel und Erde*, v., *Heft* 1 *u.* 2.)

|| ——— Der Wärmeaustausch an der Erdoberfläche und in der Atmosphaere. 1a. 8°. (*Sitzungsb. k. pruess. Akad. Wissensch. Berlin. Sitz. phys.-math. Cl.*, 22 *Dec.* liv., 1892, *p.* 1139.)

Bibliothèque Universelle [et Revue Suisse]. Archives des sciences physiques et naturelles. Troisième période. Tomes xxvii.–xxviii. 2 vols. 8°. Genève, 1892.

|| **Binnie, A. R.**—On mean or average annual rainfall, and the fluctuations to which it is subject. By A. R. Binnie. With an abstract of the discussion upon the paper. Edited by J. Forrest. 8°. London, 1892. (*Min. Proc. Inst. Civ. Eng.*, cix., 1891–92, *Part* iii.)

|| **Black, W. G.**—Description of exhibits by W. G. Black at the Liverpool International Exhibition. Slip. (*Railway Supplies' Journ.*, *Aug.* 23, 1886.)

|| **Blakesley, T. H.**—On a new barometer, called the amphisbæna. 8°. (*Phil. Mag.*, 1888, *Nov.*, *p.* 458.)

|| **Blanford, H. F.**—On meteorological observations in tropical countries. 8°. (*Compt. rend. v^e. Congr. Internat. Sc. Geogr.*)

|| **Boedl, W.**—Die Schneedecke in Bayern im Winter 1890–91. 1a. 4°. (*Beob. meteor. Stat. K. Bayern*, xiii., 1891.)

|| ——— Temperaturmittel für Bayern 1881–90. 1a. 4°. (*Beob. meteor. Stat. K. Bayern*, xiii., 1891.

Bombay, Government Observatory.—Magnetical and meteorological observations made at the Government Observatory, Bombay, in the year 1890, under the direction of C. Chambers, together with an appendix containing an account of a magnetic research. f°. Bombay, 1892.

(——— ———) Report on the condition and proceedings of the Government Observatory, Colaba, for the year which ended with the 30th June 1892. f°. s.l.e.a.

[Bombay Meteorological Office.]—Brief sketch of the meteorology of the Bombay Presidency in 1891-92. f°. s.l.e.a.

* **Bonney, T. G.**—The year-book of science. Edited by T. G. Bonney. 1891, 1892. 2 vols. sm. 8°. London, 1892-93.

Boston, Mass., Weather Bureau.—Bulletin of the New England Weather Service, under the direction of the United States Department of Agriculture, Weather Bureau. 1892, Mch.-Dec. 4°. s.l.e.a.

For previous years, see CAMBRIDGE, MASS., NEW ENGLAND METEOROLOGICAL SOCIETY.

Bremen.—Ergebnisse der meteorologischen Beobachtungen. Herausgegeben von P. Bergholz. Jahrg. ii., 1891. la. 4°. Bremen, 1892.

Brisbane, Chief Weather Bureau.—Meteorological report for 1888, 1889, 1890, and 1891. f°. (Brisbane, 1892.)

British North Borneo Herald and Official Gazette. Vol. x. 1892. Nos. 1-12. f°. Sandakan, 1892.

Contains meteorological observations.

Broounof, P.—Etude sur la couche de neige dans le bassin du Dnièpre en Octobre 1892. Travaux du réseau météorologique du bassin du Dnièpre. Tome i., No. 1. la. 8°. [Kieff], 1892.

Text in the Russian language.

Brown, A. S.—Madeira and the Canary Islands, a practical and complete guide for the use of invalids and tourists. Second edition. sm. 8°. London, 1890.

Brussels, Etat Indépendant du Congo.—Le climat de Banana en 1890, suivi des observations météorologiques faites du 1er décembre 1889 au 16 mai 1891 par E. Etienne. Publications de l'Etat Indépendant du Congo, No. 7. la. 8°. Bruxelles, 1892.

——— **Observatoire Royal.**—Bulletin météorologique. 1892, Jan. 1—Dec. 31. f°. Sheets.

Bucharest, Institutul Meteorologic al Romaniei.—Analele . . . de S. C. Hepites. Tom. v., 1889. la. 4°. Bucuresti, 1892.

In the French language also.

——— ——— Buletinul observatiunilor meteorologice din Romania publicat de S. C. Hepites. Anul i., 1892. sm. f°. Bucuresti, 1892.

‖ ——— ——— Resumatul observatiunilor meteorologice făcute la Bucureşti (Filaret) în anul 1890 şi în perióda de la 1885 la 1890. la. 4°. Bucaresti, 1893. (*Anal. Inst. Meteor. Roman.*, vi., 1890, *part* 3.)

In the French language also.

Cairo, Ministère de l'Intérieur. Administration des Services Sanitaires et d'Hygiène Publique.—Bulletin hebdomadaire. 7me année, 1892, Nos. 1-52. Suppl. au Journ. Officiel, 1892-93. la. 4°.

[Calcutta, Meteorological Office, Bengal.]—Bay of Bengal weather chart. 1892, Jan. 1—Dec. 31. sm. f°. Sheets.

——— ——— Bengal daily weather report. 1892. sm. f°. Sheets.

These reports are only published during the rainy season.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the weeks ending January 9 to December 31, 1892. f°.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the months of January to December, 1892, with annual tables. sm. f°.

——— ——— Meteorological summary for the monsoon period of 1892. sm. f°. s.l.e.a.

[——— ———-] Summary of the meteorology of the year 1891. sm. f°. s.l.e.a.

——— **Meteorological Office, India.**—Abstract of the results of meteorological observations taken at the Alipore Observatory in the months of Jan.—Dec. 1892. sm. f°. Sheets.

——— ——— Abstract of the results of the barometric and thermometric observations taken at the Meteorological Office, Chowringhee. 1892, Jan.—Dec. sm. f°. Sheets.

——— ——— India daily weather report. 1892, Jan. 1—Dec. 31. f°. Sheets.

[Calcutta, Meteorological Office, India.]—The India weather review for the year 1891. f°. Calcutta, 1892.

This is a continuation of "Report on the meteorology of India."

[——— ———] Memorandum on the snowfall in the mountain districts bordering Northern India and the abnormal features of the weather in India during the past five months, with a forecast of the probable character of the south-west monsoon rains of 1892. f°. Simla, 1892.

[——— ———] Meteorological observations recorded at seven stations in India in the year 1891, corrected and reduced. f°. Calcutta, 1892.

1889 and 1890 were not published separately but are printed as Appendix B. of the "Report of the Meteorology of India," for these years.

(——— ———) Report on the administration of the Meteorological Department of the Government of India in 1891-92. f°. s.l.e.a.

——— ——— Report on the meteorology of India in 1890. By J. Eliot. 16th year. f°. Calcutta, 1892.

Continued as the "The India Weather Review."

——— ——— Results of the meteorological observations taken at the Alipore Observatory, from Jan. 3 to Dec. 31, 1892. sm. f°. Sheets.

——— ——— Results of the barometrical and thermometrical observations taken at the Meteorological Office, Chowringhee, from 3rd January to 31st December 1892. sm. f°. Sheets.

Cambridge (Mass.), Astronomical Observatory of Harvard College.—Annals. Vol. xxx., Part iii. Measurements of cloud heights and velocities, by H. H. Clayton and S. P. Fergusson. la. 4°. Cambridge, 1892.

——— ———.— Annals. Vol. xl. Part i. Observations made at the Blue Hill meteorological observatory, Mass., U.S.A., in the year 1891. Under the direction of A. L. Rotch. la. 4°. Cambridge, 1892.

——— **New England Meteorological Society.**—Bulletin. 1892. Jan., Feb., Nos. 87, 88. 4°. s.l.e.a.

For continuation, see BOSTON, MASS., WEATHER BUREAU.

‖——— ——— Investigations of the New England Meteorological Society for the year 1890. la. 4°. Cambridge, Mass., 1892. (*Ann. Astr. Obs. Harvard Coll.*, xxxi., *Part* i.)

Cambridge Philosophical Society.—Proceedings. Vol. vii. 1889-92. 8°. Cambridge, 1892.

Cape Town, Meteorological Commission, Cape of Good Hope.—Report of the Meteorological Commission for the year 1891. sm. f°. Cape Town, 1892.

* **Capus, G.**—Observations et notes météorologiques sur l'Asie centrale et notamment les Pamirs. 8°. (*Bull. Soc. Géogr. Paris*, 7^e^ *sér.*, xiii., 1892, *p.* 316.)

Carlsruhe, Centralbureau für Meteorologie und Hydrographie.—Beiträge zur Hydrographie des Grossherzogthums Baden. Heft vii. Die Waldbedeckung des Grossherzogthums Baden. Uebersichtskarte mit erläuterndem Text. 4°. Karlsruhe, 1892.

——— ——— Deutsches meteorologisches Jahrbuch für 1891. Grossherzogthum Baden. Die Ergebnisse der meteorologischen Beobachtungen im Jahre 1891. Bearbeitet von C. Schultheiss, zugleich ii. Theil des Jahresber. . . . . für 1891. la. 4°. Karlsruhe, 1892.

——— ——— Niederschlagsbeobachtungen der meteorologischen Stationen im Grossherzogthum Baden. 1890-1892. 1-2 Halb. 6 vols. la. 4°. Karlsruhe, 1892.

——— ——— Uebersicht der Ergebnisse der an den badischen meteorologischen Stationen angestellten Beobachtungen, nebst Wasserstandsaufzeichnungen an den wichtigsten Hauptpegeln des Rheins. 1892. Jan.—Dez. f°. Sheets.

Chandler, A.—Abstract of meteorological observations made at Torquay during the year 1892. Oblong sm. 8°. Sheet.

‖ ——— Sunshine recording. The instruments and their uses. f°. Sheet. (*Torquay Directory*, 1892, *May* 18.)

Chemnitz, K. Sächsisches meteorologisches Institut. — Deutsches meteorologisches Jahrbuch für 1891. Beobachtungssystem des Königreiches Sachsen. la. 4°. Chemnitz, 1892.

——— ——— Wetterbericht. 1891, Jan. 1—Dec. 31. oblong 8°.

[——— ———] Wetterbericht. 1892, Jan.—Dec. la. 4°. (*Wissensch. Beil. der Leipziger Zeitung*, 1892-93.)

|| **Chree, C.**—On vortices. 8°. [*Proc. Edinb. Math. Soc.*, v., *p.* 52.]

|| ——— On vortex motion in a rotating fluid. 8°. (*Proc. Edinb. Math. Soc.*, vii., 1888-89, *p.* 29.)

Christiania, Den Norske Nordhavs-Expedition. 1876-1878. — xxi. Zoologi. Crinoida og Echinida ved D. C. Danielssen. f°. Christiana, 1892.

In the English language also.

——— **Norwegisches meteorologisches Institut.**—Jahrbuch. . . . für 1890. Herausgegeben von H. Mohn. sm. f°. Christiania, 1892.

|| **Chwolson, O.**—Über den gegenwärtigen Zustand der Actinometrie. Lu le 4 décembre 1891. sm. f°. St. Petersburg, 1892. (*Repert. Meteor.*, xv., *No.* 1.)

|| ——— Actinometrische Untersuchungen zur Construction eines Pyrheliometers und eines Actinometers. Der Akademie vorgelegt am 4 Nov. 1892. sm. f°. St. Petersburg, 1893. (*Repert. Meteor.*, xvi., *No.* 5.)

* **Ciel et Terre.**—Revue populaire d'astronomie, de météorologie, et de physique du globe. xiii^e^ année; 1892-93. 8°. Bruxelles, s.a.

|| **Clayton, H. H.**—The Lawrence tornado. Investigations of the New Engl. Meteor. Soc. for the year 1890. la. 4°. Cambridge, Mass., 1892. (*Ann. Astr. Obs. Harvard Coll.*, xxxi., *part* i., *p.* 137.)

Clements, H.—Clements' weather almanack, 1893, containing, in addition to the ordinary almanack, a detailed forecast for each day of the year. sm. 4°. London, [1892].

——— Clements' weather chart almanac for 1893. Specially prepared for London . . . and based entirely upon the moon's motions. oblong la. 8°. Sheet.

——— Weather prediction: or, how the weather, for any given place, may be forecasted, by means of the moon's motions and the weather records of the past. sm. 8°. London, [1892.]

——— Weather prediction No. 2; or the mistakes of the Greenwich observers and the Washington International Meteorological Conference, &c., &c. sm. 8°. [London, 1893.]

Coimbra, Observatorio Meteorologico e Magnetico da Universidade.—Observações meteorologicas e magneticas . . . 1891. f°. Coimbra, 1892.

Colombo, Public Works Department.—Return of rainfall in Ceylon during 1891, and the means during different periods. la. f°. Sheet. Dated, Colombo, 1892.

|| ——— **Surveyor General's Office.**—Report on the meteorology of Ceylon for 1891. sm. f°. (*Ceylon Administr. Rep.*, 1891, *Part* ii., *p.* B 1.)

|| ——— ——— Results of meteorological observations in Ceylon during the months of January to December 1891. f°. Sheets. (*Suppl. Ceylon Gov. Gazette*, 1891-92.)

——— ——— Return of rainfall in Ceylon during 1891, and the means during different periods. la. f°. Sheet.

|| **Cominelli, P. F.**—Rivista meteorologica dell' anno 1891-92. Fasc. 1. sm. 8°. Torino, 1893. (*Boll. mens. Osserv. Moncalieri, ser.* ii., *vol.* xii.)

Copenhagen, Dansk Meteorologisk Institut.—Bulletin météorologique du Nord, publié par les Instituts météorologiques de Norvége, de Danemark et de Suède. Année 1892. oblong 8°. Copenhague, s.a.

——— ——— Maanedsoversigt over Vejrforholdene. 1892, Jan.—Dec. f°.

——— ——— Meteorologisk Aarbog. 1888-1889. 2 vols. f°. Kjøbenhavn, 1889-90.

In the French language also.

——— **Kongelige Danske Videnskabernes Selskab.**—Oversigt over det . . . . Forhandlinger og dets Medlemmers Arbejder i Aaret 1891. la. 8°. Kjøbenhavn, 1891-92.

——— ——— Fortegnelse over de af det Kongelige Danske Videnskabernes Selskab i Tidsrummet 1742-1891 udgivne videnskabelige Arbejder. la. 8°. Kjøbenhavn, 1892.

——— **und Hamburg, Dänisches meteorologisches Institut und Deutsche Seewarte.**—Tägliche synoptische Wetterkarten für den nordatlantischen Ozean und die anliegenden Theile der Kontinente. vii. Jahrg., 1-4 Quart. Dec. 1887—Nov. 1888. 4 vols. f°. Copenhague et Hambourg, 1892.

In the French language also.

Cordoba, Academia Nacional de Ciencias.—Boletin. Tom. x.-xi. la. 8°. Buenos Aires, 1887.

* || **Coxworthy, F.**—On the constitution of the atmosphere. 8°. (*The Chemist, May*, 1847.)

|| **Cracow, C. K. Akademii Umiejętnósci w Krakowie.**—Materyały do klimatografii Galicyi zebrane przez sekcyę meteorologiczną komisyi fizyograficznej . . . 1891. la. 8°. Kraków, 1892. (*Odbitek ze Sprawozd. Kom. fizyogr.*)

——— **K. K. Sternwarte in Krakau.**—Meteorologische Beobachtungen. 1892. la. 8°. Krakau, 1892.

* **Croll, J.**—Discussions on climate and cosmology. 8°. London, 1889.

Croydon Microscopical and Natural History Club.—[Daily rainfall at stations in Kent and Surrey.] 1892. Jan.-Dec. 4°. Sheets.

|| ——— Report of the Meteorological Sub-Committee for 1891. 8°. [*Proc. and Trans. Croydon Microsc. Nat. Hist. Club*, 1891-92, *p.* 348.]
Contains rainfall obsns. only.

Cruls, L.—O clima do Rio de Janeiro. Segundo as observações meteorologicas feitas durante o periodo de 1851 a 1890. sm. f°. Rio de Janeiro, 1892.
In the French language also.

|| **Cyprus.**—Meteorological observations. 1887-1891. 5 parts. sm. f°. [*Cyprus Blue Book.*]

* **Dalton, J.**—Meteorological observations and essays. 2nd edition. 8°. Manchester, 1834.

|| **Davis, W. M.**—The Lawrence tornado of July 26, 1890. The features of tornadoes and their distinction from other storms. Investigations of the New Engl. Meteor. Soc. for the year 1890. la. 4°. Cambridge, Mass., 1892. (*Ann. Astr. Obs. Harvard Coll.*, xxxi., *part* i., *p.* 119.)

——— Meteorology in the schools. la. 8°. (*Amer. Meteor. Journ.*, ix., 1892, *p.* 1.)

|| ——— The theories of artificial and natural rainfall. la. 8°. (*Amer. Meteor Journ.*, 1892, *Mch.*, *p.* 493.)

D[avis], W. M.—Professor William Ferrel. la. 4°. (*Science*, xviii., 1891, *p.* 272.)

Davos.—Davoser Wetterkarte. Nach dem Schema von Herrn C. Wetzel, Ingenieur, herausgegeben im Auftrag des Curvereins Davos-Platz vom Amtl. Beobachter der Schweiz. meteor. Station Davos. 1892. Jan.—Dec. la. f°. Sheets.
In the French and English languages also.

[Dehra Dun, Surveyor General of India.]—General report on the operations of the Survey of India Department . . . during 1890-91. sm. f°. Calcutta, 1892.

|| **Denza, F.**—Gli strumenti registratori della Specola Vaticana e lo scoppio della polveriera del 23 Aprile 1891. la. 4°. (*Atti Accad. Pontif. Nuovi Lincei*, xliv., 1891.)

——— Pioggia di sabbia. la. 4°. (*Atti. Accad. Pontif. Nuovi Lincei*, xliv., 1891.)

|| ——— Macchie solari, perturbazioni magnetiche ed aurore polari. la. 4°. Roma, 1893. (*Atti. Accad. Pontif. Nuovi Lincei*, xlvi.)

|| **Devon.**—Report of the Committee on the climate of Devon. Edited by E. E. Glyde. 10th, 2nd series, 1891. 8°. (*Trans. Devon. Assoc. Advanc. Sc.*, xxiv., 1892, *p.* 55.)

Dewar, D.—Weather forecasts. 1893. sm. 4°. Dalkeith, s.a.

|| **Dickson, H. N.**—The meteorology of India and the surrounding sea-areas. la. 8°. (*Scott. Geogr. Mag.*, 1892, *May.*)

|| ——— The physical conditions of the waters of the English Channel. la. 8°. (*Scott. Geogr. Mag.*, 1893, *Jan.*)

Dorpat, Kaiserliche livländische gemeinnützige und ökonomische Sozietät.—Bericht über die Ergebnisse der Beobachtungen an den Regenstationen. . . für die Jahre 1889, 1890 und 1891. la. 4°. Dorpat, 1892.

|| **Dove, K.**—Niederschlagsmengen am Kap der Guten Hoffnung. 4°. (*Petermann's Mitteil.*, 1892, *p.* 167.)

Dublin, General Register Office.—Quarterly returns of the marriages, births, and deaths registered in . . . Ireland; . . . 1892. Nos. 113–116. la. 8°. Dublin, 1892–93.

——— ——— Weekly returns of births and deaths in Dublin (including its suburban districts), and in fifteen of the principal urban sanitary districts in Ireland, 1892. la. 8°. Dublin, 1893.

Dulier, [E. E.]—A natural process of dissolution for smoke and fogs. 8° London, s.a.

Duponchel, A.—La circulation des vents et de la pluie dans l'atmosphère. la. 8°. Paris, 1892.

Eastbourne.—Abstracts of weather reports for five years. July 1887–1892. 18°. (Eastbourne, 1892.)

——— Meteorological observations for the year 1892. la. 8°. Eastbourne, 1893.

[Eberswalde, Hauptstation des forstlichen Versuchswesen in Preussen.]—Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von A. Müttrich. Achtzehnter Jahrg. 1892, Jan.—Dec. 8°. Berlin, s.a.

[——— ———] Jahresbericht über die Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von Dr. A. Müttrich. xvii. Jahrg., 1891. 8°. Berlin, 1892.

Edinburgh, Royal Society.—Proceedings. Vol. xviii. 1890–91. 8°. Edinburgh, 1892.

——— **Scottish Meteorological Society.**—Journal. Third series. vol. ix. la. 8°. Edinburgh and London, 1893.

* **Edlund, E.**—Om isbildningen i hafvet. 8°. (*Skand. nat.-forskare-sällsk., Möte* 1863, *p.* 74.)

* **Elderton, W. A.**—Maps and map drawing. sm. 8°. London, 1890.

[Ellis, W.]—Map [of England and Wales] showing lines of equal magnetic declination for January 1, 1893. Supplement to the "Colliery Guardian," Jan. 6, 1893. f°. Sheet.

‖ **Elster, J., und Geitel, H.**—Beobachtungen des atmosphärischen Potentialgefälles und der ultravioletten Sonnenstrahlung. la. 8°. Wien, 1892. (*Sitzungsb. k. Akad. Wissensch. Wien, math.-naturw. Cl., Bd.* ci., *Abth.* ii., 1892, *p.* 703.)

‖ ——— ——— Elmsfeuerbeobachtungen auf dem Sonnblick. la. 8°. (*Sitzungsb. k. Akad. Wissensch. Wien, math.-naturw. Cl., Bd.* ci., *Abth.* ii. *a*, 1892, *p.* 1485.)

Emden, Naturforschende Gesellschaft.—Jahresbericht. 76. 1890–91. 8°. Emden, 1892.

‖ **Erk, F.**—Eine Windhose zwischen Gewitterwolken la. 4°. (*Beob. meteor. Stationen K. Bayern*, xiii., 1891.)

* **Erman, Adolph.**—Reise um die Erde durch Nord-Asien und die beiden Oceane in den Jahren 1828, 1829 und 1830. i. Abtheil. Historischer Bericht. Bd. i.—iii. 3 vols. 8°. Berlin, 1833–48.

* ——— ——— Naturhistorischer Atlas. f°. Berlin, 1835.

* ——— ——— 11 Tafeln des Atlas zu Erman's Reise um die Erde. Ausgegeben mit dem dritten Bande der ersten Abtheilung. f°. Berlin, 1848.

Etienne, E.—Le climat de Banana en 1890.
See Brussels, Etat Indépendant du Congo.

Falmouth, Royal Cornwall Polytechnic Society.—Annual report. 59th. 1891. 8°. Falmouth, s.a.

Fiume, K. K. Marine-Akademie.—Meteorologische Beobachtungen. 1892. Jan.—Dec., and Results. la. 8°. Sheets.

Foerster, W., und Jesse, O.—Aufforderung zu Beobachtungen der leuchtenden Nachtwolken. 8°. Dated, Berlin, 1892.

‖ **Fox, W. L.**—Meteorological tables for Falmouth and the Scilly Islands, for the year 1891. . . . 8°. Falmouth, [1892]. (*Ann. Rep. R. Cornw. Polyt. Soc.*, 1891.)

Frankfurt am Main, Physikalischer Verein.—Jahresbericht . . . für das Rechnungsjahr 1890–91. 8°. Frankfurt am Main, 1892.

Fritsche, H.—Ueber die Bestimmung der geographischen Länge und Breite und der drei Elemente des Erdmagnetismus durch Beobachtung zu Lande sowie erdmagnetische und geographische Messungen an mehr als tausend verschiedenen Orten in Asien und Europa, ausgeführt in den Jahren 1867–1891. la. 8°. St. Petersburg, 1893.

Geneva, Société de Géographie.—Le Globe. Journal géographique. Tome xxxi. la. 8°. Genève, 1892.

Genoa, Osservatorio Meteorologico della Regia Università.—Stato meteorologico e magnetico di Genova. 1889–1891. Anni lvii.–lix. 3 vols. la. 4°. Genova, 1890–92.

‖ **Glyde, E. E.**—Abstract of meteorological observations made at Kirkham, Babbacombe, Torquay, during the year 1892. f°. Sheet. (*Torquay Directory.*)

Greenwich, Royal Observatory.—Report of the Astronomer Royal to the Board of Visitors . . . read . . . 1892, June 4. la. 4°. s.l.e.a.

——— ——— Results of the magnetical and meteorological observations made at the Royal Observatory, Greenwich, in the year 1889; under the direction of W. H. M. Christie. la. 4°. London, 1891.

Greenwood, W. N.—Greenwood's nautical, general, and coasting kludonometric tide tables . . . . 1893. sm. 4°. Lancaster, s.a.

Grenada, Richmond Hill Observatory.—Meteorological report, 1891. By J. M. Lash. f°. s.l.e.a.

——— ——— Meteorological report. By J. M. Lash. 1891, Jan. 1—Dec. 31. 1892, Jan.—Dec. sm. f°. Sheets.

* **Griffin, C., and Co.**—Year-book of the Scientific and Learned Societies of Great Britain and Ireland: comprising lists of the papers read during 1891 . . . with the names of their authors. 9th annual issue. 8°. London, 1892.

‖ **Gubb, A. S.**—Ilfracombe as a winter resort. Slip. (*Med. Press and Circular, Jan.* 18, 1893.)

‖ **Habenicht, H.**—Häufigkeit der Eisberge im Golfstrome und Klimaschwankungen. sm. f°. (*Ausland*, 1892, *Nr.* 49.)

Habenicht, [H.]—Trockenperioden, Influenza und Cholera. Newspaper cutting. (*Gotha. Tageblatt, Beil. zu Nr.* 12, *Jan.* 14, 1893.)

Halle, Kaiserliche leopoldino-carolinische deutsche Akademie der Naturforscher.—Leopoldina. Heft xxvii. 1891. la. 4°. Halle, 1891.

‖ **Hamberg, H. E.**—Sur une prétendue période de presque 26 jours dans les orages. 8°. Stockholm, 1892. (*K. Svenska Vet.-Akad. Handl.*, xviii., *Afd.* i.)

Hamburg, Deutsche Seewarte.—Annalen der Hydrographie und maritimen Meteorologie. xx. Jahrg., 1892. la. 8°. Berlin, s.a.

For previous years, see BERLIN, HYDROGRAPHISCHES AMT.

——— ——— Aus dem Archiv der Deutschen Seewarte. xiv. Jahrg., 1891. la. 4°. Hamburg, 1892.

——— ——— Deutsches meteorologisches Jahrbuch für 1891. Beobachtungs-System der Deutschen Seewarte. Ergebnisse der meteorologischen Beobachtungen . . . Jahrg. xiv. sm. f°. Hamburg, 1892.

——— ——— Deutsche ueberseeische meteorologische Beobachtungen. Heft. iv.–v. 2 vols. sm. f°. s.l.e.a.

——— ——— Monatsbericht der Deutschen Seewarte für jeden Monat des Jahres 1891. Jahrg. xvi. la. 8°. Hamburg, s.a.

——— ——— Resultate meteorologischer Beobachtungen von Deutschen und Holländischen Schiffen für Eingradfelder des nordatlantischen Ozeans. Quadrat 113. No. x. la. 4°. Hamburg, 1891.

——— ——— Vierteljahrs-Wetter-Rundschau an der Hand der täglichen synoptischen Wetterkarten für den nordatlantischen Ocean des Dänischen meteorologischen Instituts und der Deutschen Seewarte. Bd. iv. 1886–87. la. 8°. Berlin, 1892.

——— ——— Wetterbericht. Jahrg. xvii. 1892, Jan. 1.—Dec. 31. f°. Sheets.

‖ **Hann, J.**—Einige Resultate stündlicher meteorologischer Beobachtungen auf dem Gipfel des Fuji in Japan. la. 8°. (*Sitzungsb. k. Akad. Wissensch. Wien, math.-naturw. Cl., Bd.* c., *Abth.* ii., 1891, *p.* 1248.)

|| **Hann, J.**—Weitere Untersuchungen über die tägliche Oscillation des Barometers. la. 4°. Wien, 1892. (*Denkschr. math.-naturw. Cl. k. Akad. Wissensch., Wien*, lix., *p.* 297.)

|| ——— Weitere Untersuchungen über die tägliche Oscillation des Barometers la. 8°. (*Anzeiger Sitz. math.-naturw. Cl., k. Akad. Wissensch. Wien, Nr.* xi., 1892.)

——— Resultate der meteorologischen Beobachtungen zu Sanchez, Samana Bay, S. Domingo. sm. f°. (*Meteor. Zeitschr.*, 1893, *Feb.*, *p.* 67.)

Harvey, C. W.—Summary of meteorological observations of temperature and rainfall taken at Throcking Rectory, Buntingford, Herts. 1880–89. oblong sm. 8°. Sheet.

Hazen, H. A.—The production of rain. 4°. (*Monthl. Rep. Maryland State Weather Service*, 1892, *Dec.*)

——— Secrets of the atmosphere. la. 4°. (*Science*, xxi., *No.* 532, 1893, *p.* 202.)

Heinrichs, A.—Snö- och Isförhållandena i Finland år 1890. la. 8°. (*Bidr. Känn. Finl. Natur. o Folk.*, li., *p.* 233.)

Hellmann, G.—Das älteste Berliner Wetter-Buch, 1700-1701, von Gottfried Kirch und seiner Frau Maria Margaretha geb. Winkelmann. la. 8°. Berlin, 1893.

Helsingfors, Finska Vetenskaps-Societeten. — Öfversigt af Finska Vetenskaps-Societetens Förhandlingar. xxxiii.–xxxiv., 1891-92. 2 vols. la. 8°. Helsingfors, 1891-92.

——— **Institut Météorologique Central de la Société des Sciences de Finlande.**—Observations. Vol. x. 1891. f°. Helsingfors, 1892.

|| **Henrici, O.**—Harmonischer Analysator. 8°. (*Deutsche Math.-Vereinigung. Katalog math. Modelle, Apparate und Instr.*, 1892.)

|| ——— Über Instrumente zur harmonischen Analyse. 8°. München, 1892. (*Deutsche Math.-Vereinigung. Katalog math. Ausstellung Nürnberg*, 1892.)

|| **Herrmann, E.**—Die stürmischen Winde an der deutschen Küste in den Jahren 1878–87. Anhang: Die stürmischen Winde auf Adlergrund im Vergleich zu denen an einigen Stationen der deutschen Ostseeküste. la. 4°. Hamburg, 1891. (*Archiv. Deutsch. Seewarte*, xiv., 1891, *No.* 4.)

* **Himmel und Erde.**—Illustrirte naturwissenschaftliche Monatsschrift. Herausgegeben von der Gesellschaft Urania zu Berlin. Redacteur: M. W. Meyer. iv. Jahrg. la. 8°. Berlin, 1892.

Hobart, Royal Society of Tasmania.—Papers and proceedings . . . for 1891. 8°. Hobart, 1892.

Hong-Kong Observatory.—Observations. 1891. f°. Hong-Kong, 1892.

* **Hooper, C. S. L.**—Report of the cruise of the U.S. Revenue-Steamer Corwin in the Arctic Ocean. November 1, 1880. 8°. Washington, 1881.

* **Hopkins, T.**—On the atmospheric changes which produce rain and wind, and on the fluctuations of the barometer. Second edition, with additional essays and diagrams. 8°. London, 1854.

* **Houdaille, F.**—Le soleil et l'agriculteur. Avec un appendice sur la lune et les influences lunaires. sm. 8°. Montpellier et Paris, 1893.

* || **Howard, L.**—On the modifications of clouds, and on the principles of their production, suspension, and destruction: being the substance of an essay read before the Askesian Society in the Session 1802–3. 8°. London, s.a. (*Phil. Mag.*, xvi., 1803, *pp.* 93 *and* 344; xvii., *p.* 5.)

Contains also Meteorological Journals, kept during voyages from Whitby to Greenland and back again, on board the ship Resolution in the years 1807–1810 by W. Scoresby, jun.

* **Hutchins, C. C.**—Radiation of atmospheric air. la. 8°. (*Amer. Journ. Sc.*, 3*rd ser.*, xliii., 1892, *p.* 357.)

|| **Inwards, R.**—On an instrument for drawing parabolic curves. Read before the Physical Soc. on May 13, 1892. 8°. (*Phil. Mag.*, 1892, *July*, *p.* 57.)

* || **Irminger, C.**—Surface temperatures in the North Atlantic. 8°. (*Journ. R. Geogr. Soc. London*, 1870.)

Ithaca, New York Weather Service.—Report of the New York Weather Service, . . . issued in co-operation with the New York State Meteorological Bureau. 1892, Jan.—Dec. la. 4°. s.l.e.a.

For Jan. to Mch. the title is "Report of the New York Meteorological Bureau."

Jamaica.—Jamaica rainfall for the years 1890 and 1891. 2 parts. sm. f°. Dated, Kingston, 1892.

Nos. 149 and 151 of "Jamaica Weather Report."

* ——— The handbook of Jamaica for 1892 : published by authority, comprising historical, statistical and general information concerning the Island. Twelfth year of publication. Compiled . . . by S. P. Musson and T. L. Roxburgh. 8°. London and Kingston, 1892.

‖ ——— Weather report for the months of Jan.—Dec. 1892. sm. f°. Kingston, 1892-93. (*From the Jamaica Gazette.*)

‖ **Kammermann, A.**—Résumé météorologique de l'année 1891 pour Genève et le Grand Saint-Bernard. 8°. Genève, 1892. (*Arch. Sc. Phys. Nat.*, 1892, *Aug.*, *Sept.*)

Karlinski, [F.]—Stan Wody na rzekach Galicyjskich oraz opad atmosferyczny . . . . . [Water level in rivers of Galicia together with the precipitation of the atmosphere . . . . .]. 1889, 1890. 2 vols. 8°. Lwów, 1892.

Kassner, C.—Ueber kreisähnliche Cyklonen. la. 4°. Berlin, 1893.

* ‖ **Kersten, O.**—Meteorologie von Sansibar in Monatsmitteln. la. 8°. Leipzig und Heidelberg, 1879. (*v. d. Decken, Reisen* iii., 3, *Meteor. &c.*)

Kiel, Ministerial-Kommission zur Untersuchung der Deutschen Meere.—Ergebnisse der Beobachtungsstationen an den deutschen Küsten über die physikalischen Eigenschaften der Ostsee und Nordsee und die Fischerei. Jahrg. 1891. Heft i.—xii. Oblong 8°. Berlin, 1892.

* **Klein, H. J.**—Jahrbuch der Astronomie und Geophysik. i.–iii. Jahrg., 1890–1892. 3 vols. 8°. Leipzig, 1891–93.

Klossovsky, [A.] — L'anémographe de M. Timtchenko. la. 8°. Dated Odessa, 1889. [Pecchatano po opred'leiyu Sovyeta Novorossiiskagho Obshchestvo Estestvoisp'itatelei.]

Krasno, Agrarmeteorologisches Observatorium des Neutrathaler landwirtschaftlichen Vereines.—Grafische Darstellung der Niederschläge im Neutrathale an der Stazion Alt-Krásno (vordem Nedanócz) wärend der Jahre 1866–1891. la. 4°. Ó-Széplak, 1892.

In the Hungarian language also.

——— ——— Wetterkalender für Ungarn. 1892. Jahrg. ix. Nos. 1-31. sm. 4°. Sheets.

——— **Agrarmeteorologisches Observatorium zu Alt-Krasno (vordem Nedanócz).**—Monatsberichte 1892 über die regelmässigen Beobachtungen. Jan.—Dez. la. 4°. Alt-Krasno, 1892.

* ‖ **Krueger, A.**—Ueber die mittlere Temperatur zu Helsingfors nach den Beobachtungen des magnetisch-meteorologischen Observatoriums, 1845–1856. 4°. Helsingfors, 1874. (*Abhandl. Finn. Soc. Wissensch.*)

* **Kunzek, A.**—Leichtfassliche Darstellung der Meteorologie. la. 8°. Wien, 1847.

Lagos, Colonial Surgeon.—Meteorological observations taken at Lagos. 1892, Jan.—Dec. f°. Sheets. (*Gov. Gazette*, 1892.)

Lahore, Meteorological Reporter to Government, Punjab.—Summary of meteorological conditions prevailing over the Punjab. 1892. Jan.—Dec. f°. Sheets.

——— **Sanitary Commissioner.**—Report on the Sanitary Administration of the Punjab for the year 1891. f°. Lahore, 1892.

‖ **Lancaster, A.**—Le climat de la Belgique en 1892. sm. 8°. Bruxelles, 1893. (*Ann. Obs. R. Belgique*, 1893.)

‖ **(Lang, C.)**—Bericht über die Thätigkeit der kgl. bayerischen meteorologischen Centralstation und der ihr angeschlossenen Stationen im Jahre 1891. la. 4°. (*Beob. meteor. Stationen K. Bayern*, xiii., 1891.)

|| **Lang, C.**—Die Fortpflanzungsgeschwindigkeit der Gewitter in Suddeutschland während des Jahres 1891. la. 4°. (*Beob. meteor. Stationen K. Bayern*, xiii., 1891.)

|| ——— Zwei Influenza-Epidemien in München und die sie begleitenden meteorologischen Verhältnisse. la. 4°. (*Beob. meteor. Stationen K. Bayern*, xiii., 1891.)

|| ——— Welchem Zwecke sollen die Wettersäulen dienen? la. 8°. (*Bayer. Industrie- und Gewerbeblatt, München*, 1892, *Nro.* 16–19.)

|| ——— Ein Gang durch eine meteorologische Centralstation. la. 4°. (*Ausland*, 1893, *Nr.* 12 *u.* 13.)

* **La Pérouse, J. F. G. de.**—Voyage de La Pérouse autour du monde, . . . rédigé par L. A. Milet-Mureau. Tomes i.–iv. 4 vols. 8°. Paris, 1798. Atlas. fo. s.l.e.a.

Lees, J. C.—Meteorological journal for the years 1838, 1840, kept at Nassau, New Providence, Bahamas. 2 vols. sm. f°. s.l.e.a.

|| **Leyst, E.**—Untersuchungen über die Bodentemperatur in Königsberg in Pr. 4°. (*Schrift. phys.-ökonom. Gesellsch. Königsberg in Pr.*, xxxiii., 1892.)

|| **Lingg, F.**—Meteore und Erdbeben im Jahre 1891. la. 4°. (*Beob. meteor. Stationen K. Bayern*, xiii., 1891.)

Lisbon, Observatorio do Infante D. Luiz.—Annaes. 1888. vol. xxvi. f°. Lisboa, 1892.

——— ——— Annaes . . . . Observações dos postos meteorologicos segundo o plano adoptado no Congresso de Vienna d'Austria. 1886. f°. Lisboa, 1891.

——— ——— Boletim meteorologico. 1892, Jan. 1—Dec. 31. f°. Sheets.

Liverpool Observatory.—Meteorological results, deduced from observations taken at the Liverpool Observatory during the years 1889-90-91. la. 8°. Liverpool, 1893.

Lloyd's Seaman's Almanac.—1893. 8°. London, 1893.

* **Lodge, O. J.**—Lightning conductors and lightning guards. sm. 8°. London, 1892.

London, Admiralty.—Tide tables for the British and Irish Ports, for the year 1893; . . . . Computed by H. R. Harris. la. 8°. London, [1892].

——— ——— **Hydrographic Office.**—Rules for finding distances and heights at sea. By the late Lieut. H. Raper. 5th edition. 8°. London, 1866.

——— ——— ——— A new method of clearing the lunar distance. By Sir G. B. Airy. la. 8°. London, 1881.

——— ——— ——— Remarks on revolving storms. Third edition. 8°. London, 1883.

——— ——— ——— General instructions for the hydrographic surveyors of the Admiralty. la. 8°. London, 1888.

——— ——— ——— Chart of the world showing tracks followed by full powered steam vessels. la. f°. London, 1889.

——— ——— ——— Report on the movements of the ice, currents, and tidal streams, on the coast of Newfoundland and in the Gulf of St. Lawrence. By Commander George Robinson. sm. f°. London, 1889.

——— ——— ——— Supplement to a report on the movements of the ice, &c., on the coast of Newfoundland, 1889, comprising the journey of the ice from Baffin Bay to the Banks of Newfoundland. By Commander George Robinson. sm. f°. London, 1891.

——— ——— ——— Information relating to currents, ice, and magnetism, with general remarks on the navigation on the coast of Iceland. By Lieut. C. F. Wandel, 1879. Also information relating to harbours, tides, and weather in the Faröe Islands. By the Rev. G. Landt. 1872. la. 8°. London, 1891.

——— ——— ——— The Færoe Islands Pilot. la. 8°. London, 1891.

——— ——— ——— Notes bearing on the navigation of H.M. Ships. Third edition. la. 8°. London, 1892.

——— **Army Medical Department.**—Annual abstract of meteorological observations taken at Netley and foreign stations in the year 1890. la. 8°. (*Army Med. Dep. Rep.*, 1890, *App.* vii., *p.* 376.)

London, Board of Trade.—Abstracts of the returns made to the Board of Trade of shipping casualties . . . from the 1st July 1890 to the 30th June 1891 . . . with charts and appendices. sm. f°. London, 1892.

——— **British Association for the Advancement of Science.**—Report. Edinburgh, 1892. 8°. London, 1893.

* ——— **Edinburgh, and Dublin Philosophical Magazine** and Journal of Science. Fifth series. Vols. xxxiii.-xxxiv., 1892. 2 vols. 8°. London, s.a.

——— **Foreign Office.**—Report on subjects of general and commercial interest. Miscellaneous series, No. 246. Spain. Report on the social and economical condition of the Canary Islands. la. 8°. London, 1892.

——— **General Register Office.**—Annual report of the Registrar-General of births, deaths, and marriages in England. 1891. 54th. la. 8°. London, 1892.

——— ——— Annual summary of births, deaths, and causes of death in London and other great towns, 1891-92. 2 vols. la. 8°. London, 1892-3.

——— ——— Quarterly return of marriages, births, and deaths registered in . . . England, Nos. 173-176, 1892. la. 8°. London, 1892-93.

——— ——— Weekly return of births, and deaths in London and . . . other great towns. Vol. liv., 1892. la. 8°. London, 1892.

——— **Imperial Institute.**—The year book of the Imperial Institute of the United Kingdom, the Colonies, and India. 1st Issue. 1892. la. 8°. London, 1892.

——— **Meteorological Office.**—Daily weather report. 1892, Jan. 1—Dec. 31. 2 vols. la. 4°. s.l.e.a.

——— ——— Hourly means of the readings obtained from the self-recording instruments at the four observatories under the Meteorological Council. 1889. la. 4°. London, 1892.

——— ——— Meteorological observations at stations of the second order for the year 1888. la. 4°. London, 1892.

——— ——— Report of the Meteorological Council to the Royal Society, for the year ending 31st of March 1892. la. 8°. London, 1893.

——— **Royal Astronomical Society.** — Monthly notices. lii. 1891-2 8° London, 1892.

——— **Royal Geographical Society.**—Proceedings . . . and monthly record of geography. New monthly series. Vol. xiv., 1892. la. 8°. London 1892.

——— **Royal Meteorological Society.**—Hints to meteorological observers, with instructions for taking observations, and tables for their reduction. Prepared under the direction of the Council of the Royal Meteorological Society, by W. Marriott. Third edition. la. 8°. London, 1892.

——— ——— The meteorological record. Monthly results of observations made at the stations of the R. Meteor. Soc., with remarks on the weather. By W. Marriott. Vol. x. 1891. la. 8°. London, 1892.

Contains also "Meteorology of England during the quarters ending March to December 1891." By J. GLAISHER.

——— ——— Quarterly Journal. Vol. xviii. 1892. la. 8°. London, 1892.

——— **Royal National Life-boat Institution.**—The life-boat. Vol. xiv., 1889-91. la. 8°. London, 1891.

——— **Royal Society.** — Proceedings. Vols. l.-li. 1891-92. 2 vols. 8°. London, 1892.

——— **Royal United Service Institution.**—Journal. Vol. xxxvi. 8°. London, 1892.

——— **Society of Arts.** — Journal. Vol. xi. 1891-92. la. 8°. London, 1892.

Lorenz-Liburnau, J. Ritter v. — Resultate forstlich-meteorologischer Beobachtungen insbesondere in den Jahren 1885-1887. Unter Mitarbeit des K. K. Forst-Assistenten F. Eckert. II. Theil. la. 8°. Wien, 1892. (*Mittheil. forstl. Versuchsw. Österr., Heft* xiii.)

Lyons, Observatoire.—Météorologie Lyonnaise par C. André. 1887-88—1889-90. 3 vols. 4°. Lyon, 1889-91.

Macfarlane, A.—[Rainmaking experiments at San Antonio by General Dyrenforth.] Newspaper cuttings. ("*The World*," *Dec.* 4, 1892; "*The Chicago Tribune*," *Dec.* 24, 1892.)

McLandsborough, J., and Preston, A. E.—Meteorology of Bradford for 1892. f°. Sheet.

Madras, Government Observatory.—Results of meteorological observations made at the Government Observatory, Madras, during the years 1861–1890, under the direction of the late N. R. Pogson. Edited by C. M. Smith. la. 4°. Madras, 1892.

Madrid, Observatorio.—Observaciones meteorológicas efectuadas en el observatorio de Madrid durante los años 1890 y 1891. 8°. Madrid, 1892.

——— ——— Resumen de las observaciones meteorológicas efectuadas en la Peninsula y algunas de sus islas adyacentes durante el año de 1889. 8°. Madrid, 1891.

Magdeburg.—Jahrbuch der meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung. Herausgegeben von A. W. Grützmacher. Bd. x., Jahrg. xi., 1891. la. 4°. Magdeburg, 1892.

Manchester Literary and Philosophical Society.—Memoirs and proceedings. 4th series. Vols. v.–vi. 2 vols. 8°. Manchester, 1892.

——— **Sheffield, and Lincolnshire Railway.**—Monthly statement of rain fallen in the year ending 31st December, 1892. la. 4°. Sheet.

Manila.—Señales para anunciar temporal ó avenida del rio que ha de hacer el Semáforo de Manila y la Capitania del Puerto. sm. f°. Sheet. Dated, Manila, 1892.

Manson, M.—The circulation of the atmosphere of planets. Read June 3, 1892. (*Trans. Techn. Soc. Pacific Coast, San Francisco*, ix., *p.* 127.)

Margate, Medical Officer of Health.—Annual report of the medical officer of health: also the meteorological report for the year 1891. 8°. Margate, s.a.

Marseilles, Commission de Météorologie du Département des Bouches-du-Rhone.—Bulletin annuel. Année 1891. 10me année. 4°. Marseille, 1892.

|| **Marsh, C. C.**—A report upon some of the magnetic observatories of Europe. la. 4°. Washington, 1891. (*Washington Obsns.*, 1887, *App.* i.)

|| **Mascart, [E.]**—Sur l'arc-en-ciel. 8°. (*Ann. Chim. Phys.*, 6e *sér.*, xxvi., 1892, *Août.*)

Mathiesen, H.—Étude sur les courants et sur la température des eaux de la mer dans l'Océan Atlantique. la. 8°. Christiania, 1892.

[Mauritius, Royal Alfred Observatory.]—Annual report . . . for the year 1890. sm. f°. s.l.e.a.

|| ——— ——— Results of meteorological observations taken during the years 1890, 1891, at the Royal Alfred Observatory, Mauritius. 2 vols. sm. f°. (*Mauritius Blue Book*, 1890, 1891.)

Melbourne Observatory.—Monthly record of results of observations in meteorology, terrestrial magnetism, &c., &c. . . . . 1891, Jan.—Dec. la. 8°. Melbourne, s.a.

Mendenhall, T. C.—Report of studies of atmospheric electricity. la. 4°. (*Mem. Nat. Acad. Sc., Washington*, v., 1891, *p.* 113.)

Meteorologische Zeitschrift.—Herausgegeben im Auftrage der Oesterreichischen Gesellschaft für Meteorologie und der Deutschen Meteorologischen Gesellschaft. ix. Jahrg. (xxvii. Bd. d. Zeitschr. oesterr. Gesellsch. Meteor.) 1892. la. 8°. Wien, s.a.

Mexico, Sociedad Cientifica "Antonio Alzate."—Memorias. Tomo v. 1891–92. 8°. México, 1891.

Milan, R. Osservatorio Astronomico di Brera in Milano.—Osservazioni meteorologiche eseguite nell' anno 1892, col riassunto composto sulle medesime da E. Pini. sm. f°. s.l.e.a.

Milet-Mureau, L. A.—Voyage de La Pérouse autour du monde.
See La Pérouse, J. F. G. de.

|| **Mill, H. R.**—The Clyde sea area. Read May 18, 1891. la. 4°. Edinburgh, 1892. (*Trans. R. Soc. Edinb.*, xxxvi., *part* iii., *p.* 641.)

|| **Mills, H. F.**—Evidence of vorticular motion in the Lawrence tornado. Investigations of the New Engl. Meteor. Soc. for the year 1890. la. 4°. Cambridge, Mass., 1892. (*Ann. Astr. Obs. Harvard Coll.*, xxxi., *part* i., *p.* 153.)

|| **Mohn, H.**—Mittheilungen aus dem Norwegischen meteorologischen Institute. sm. f°. (*Meteor. Zeitschr.*, 1891, *July*, *p.* 247.)

|| ——— Studien über Nebelsignale. la. 8°. (*Ann. Hydr. mar. Meteor*, 1892, *März u. Apl.*)

——— **und Nansen, F.**—Wissenschaftliche Ergebnisse von Dr. F. Nansens Durchquerung von Grönland, 1888. (Ergänzungsheft No. 105 zu Petermann's Mitteil.) sm. f°. Gotha, 1892.

|| **Monaco, Prince Albert Ier de.**—Projet d'observatoires météorologiques sur l'Océan Atlantique. 4°. (*Compt. rend. acad. sc.*, cxv., 1892.)

Munich.—Report of the international meteorological conference at Munich, August 26th—September 2nd, 1891. Published by authority of the Meteorological Council. la. 8°. London, 1893.

——— Bericht über die Verhandlungen der internationalen Conferenz der Repräsentanten der meteorologischen Dienste aller Länder zu München. 26 August bis 2 September 1891. la. 8°. München, [1892].

——— **K. [b.] meteorologische Centralstation.** — Beobachtungen der meteorologischen Stationen im Königreich Bayern . . . xiii. Jahrg., 1891. sm. f°. München, 1892.

|| ——— ——— Uebersicht über die Witterungsverhältnisse im Königreiche Bayern. 1892, Jan.—Dec. la. f°. Sheets. (*Separat-Abdruck aus der "Augsburger-Abendzeitung."*)

——— ——— Wetterkarte und Wetterbericht. 1892, Jan. 1—Dec. 31. oblong f°. Sheets.

* **Nature.**—A weekly illustrated journal of science. Vols. xlv.-xlvi. 1891-92. 2 vols. la. 8°. London and New York, s.a.

* **Nature, La.**—Revue des sciences et de leurs applications aux arts et à l'industrie. Journal hebdomadaire illustré. xx^e^ année, 1892. 1^er^ et 2^e^ Semestres. 2 vols. sm. f°. Paris, s.a.

* **Nautical Magazine** and Journal of the Royal Naval Reserve. Enlarged series. Vol. lxi., 1892. la. 8°. London, s.a.

New York, American Geographical Society.—Journal. Vol. xxiv., 1892. la. 8°. New York, s.a.

——— **Meteorological Observatory.**—Report. 1891. 4°. New York, 1891.

Nice, Société de Médecine et de Climatologie de Nice.—Nice-Médical. 16^e^ année, 1891-92, Nos. 1-12. la. 8°. Nice, 1891-92.

|| **Nordenskiöld, G.**—Preliminärt meddelande rörande en undersökning af snökristaller. 8°. (*Geol. Fören. i Stockholm Förhandl.*, xv., 1893, *p.* 146.)

Odessa, Observatoire Météorologique de l'Université.—Revue météorologique. Travaux du réseau météorologique du sud-ouest de la Russie l'année 1891. Vol. ii: par A. Klossovsky. la. 4°. Odessa, 1892.
Text in Russian language.

|| **Oliver, F. W.**—On the effects of urban fog upon cultivated plants. The second report presented to the Scientific Committee of the R. Hortic. Soc., Feb. 14, 1893, by F. W. Oliver. With the assistance of F. E. Weiss and Miss M. F. Ewart. 8°. (*Journ. R. Hortic. Soc., Part* i., *vol.* xvi.)

Oxford, Radcliffe Observatory.—Results of meteorological observations made at the Radcliffe Observatory, Oxford, in the year 1887, under the superintendence of E. J. Stone. Vol. xlv. la. 8°. Oxford, 1891.

Paris, Académie des Sciences.—Comptes rendus hebdomadaires des séances. . . . Tomes cxiv.-cxv., 1892. 2 vols. 4°. Paris, 1892.

——— **Association Française pour l'Avancement des Sciences.**—Comptes Rendus. Sessions 1-7. 7 vols. 8°. Paris, 1873-79.

Session 1.—Bordeaux, 1872.
„ 2.—Lyon, 1873.
„ 3.—Lille, 1874.
„ 4.—Nantes, 1875.
„ 5.—Clermont-Ferrand, 1876.
„ 6.—Le Havre, 1877.
„ 7.—Paris, 1878.

Paris, Bureau Central Météorologique de France.—Annales . . . publiées par E. Mascart. Année 1890. i.–iii. 3 vols. la. 4°. Paris, 1892.

——— ——— Bulletin international. xxxvi^e année. 1892. Jan. 1—Dec. 31. 4°.

——— **Comité International des Poids et Mesures.**—Procès Verbaux des séances de 1891. 8°. Paris, 1892.

——— ——— Quinzième rapport aux Gouvernements Signataires de la Convention du Mètre sur l'exercice de 1891. sm. f°. Paris, 1892.

——— **Dépôt des Cartes et Plans.**—Atlas des vents et des courants dans l'Océan Atlantique. la. f°. (Paris, 1870.)

——— **Ministère de la Marine et des Colonies.**—Revue maritime et coloniale. Tomes cxiii.–cxvi. 4 vols. la. 8°. Paris, 1892–93.

——— **Observatoire Municipal de Montsouris.**—Annuaire . . . pour les années 1892–1893. 1 vol. 18°. Paris, s.a.

——— **Service Hydrographique de la Marine.**—Annales hydrographiques. 2^e série. Tome xiv. 1892. la. 8°. Paris, 1892.

——— **Service Hydrométrique du Bassin de la Seine.**—Observations sur les cours d'eau et la pluie centralisées pendant l'année 1891 . . . 7 plates. f°. Versailles, s.a.

——— ——— Résumé des observations centralisées . . . pendant l'année 1891 . . . la. 8°. Versailles, 1892. (*Ann. soc. météor. Fr.*, xli., 1893.)

——— **Société Météorologique de France.**—Annuaire. Tome xxxix. 1891. la. 8°. Paris, s.a.

|| **Paul, G.**—Observations of temperature of the Nidd from March 1889 to July 1891. 8°. London, 1892. (*Rep. Br. Assoc. Advanc. Sc.*, 1891, *p.* 490.)

|| **Paulsen, A.**—Communications de l'observatoire magnétique de Copenhague. la. 8°. Copenhague, 1892. (*Bull. Acad. R. Sc. et Lettres Danemark*, 1892.)

|| ——— Perturbation magnétique des 13 et 14 février 1892. la. 8°. (*Bull. Acad. R. Sc. et Lettres Danemark*, 1892, *p.* 69.)

Peek, C. E.—Meteorological observations for the year 1891. Rousdon Observatory, Devon. Vol. viii. 4°. London, 1892.

(Perpignan, Commission Météorologique Départementale des Pyrenées-Orientales.) — Bulletin météorologique annuel . . . par le Dr. Fines. xix., 1890. 4°. Perpignan, 1891.

Petermann's (Dr. A.) Mitteilungen aus Justus Perthes' geographischer Anstalt. Herausgegeben von A. Supan. 38 Bd., 1892. 4°. Gotha, s.a.

——— ——— aus Justus Perthes' geographischer Anstalt. Herausgegeben von A. Supan. Ergänzungsband xxii. la. 8°. Gotha, 1892.

Philadelphia, American Philosophical Society.—Proceedings of the American Philosophical Society held at Philadelphia for promoting useful knowledge. Vol. xxx., 1892. la. 8°. Philadelphia, 1892.

——— **Franklin Institute.**—The journal of the Franklin Institute devoted to science and the mechanic arts. Vols. cxxxiii.–cxxxiv., 1892. 2 vols. 8°. Philadelphia, 1892.

* **Philips' popular maps** of the counties of England. 48 maps. sm. 8°. London and Liverpool, s.a.

* **Pointer, J.**—A rational account of the weather, showing the signs of its several changes and alterations, together with the philosophical reasons of them. sm. 8°. Oxford, 1723.

Pola, hydrographisches Amt der k. k. Kriegsmarine.—Meteorologische und magnetische Beobachtungen. 1892, Jan.—Dec., and Results. oblong la. 8°.

——— **K. K. hydrographisches Amt.**—Mittheilungen aus dem Gebiete des Seewesens. Jahrg. 1892. xx. Bd. la. 8°. Pola, 1892.

Porto Rico, Jefatura de Obras Públicas de la Isla de Puerto Rico.—Resúmen de las observaciones meteorológicas verificadas. 1892. Jan.—Dec. 8°. Sheets.

Prague, K. K. Sternwarte.—Magnetische und meteorologische Beobachtungen . . . . 1891. la. 4°. Prag, 1892.

Prague, Technisches Bureau des Landesculturrathes für das Königreich Böhmen.—Ergebnisse der ombrometrischen Beobachtungen in Böhmen für das Jahr 1891. 4°. Prag, 1892.

In the Czeck language also.

——— ——— Ergebnisse der Wasserstandsbeobachtungen an den Flüssen Böhmens für das Jahr 1891. 4°. Prag, 1892.

In the Czeck language also.

——— ——— Die Einrichtung des Wasserstands-Prognosendienstes an der Elbe in Böhmen. 4°. Prag., 1892.

In the Czeck language also.

Prince, C. L.—The summary of a meteorological journal kept by C. L. Prince at his Observatory, Crowborough Hill, Sussex. 1891, 1892. 2 papers. sm. f°. s.l.e.a.

——— A record of the rainfall at Uckfield, Sussex, England, from 1843 to 1892 inclusive; also an account of the great snow storm which occurred in Sussex, Dec. 25th, 1836. 8°. s.l. 1893.

|| **Rajna, M.**—Sull' escursione diurna della declinazione magnetica a Milano in relazione col periodo delle macchie solari. Adunanza 9 giugno 1892. la. 8°. (*Rend. R. Ist. Lombardo, Ser.* ii., xxv., *Fasc.* xiii.)

* **Reid, W.**—An attempt to develop the law of storms by means of facts, arranged according to place and time; and hence to point out a cause for the variable winds, with the view to practical use in navigation. la. 8°. London, 1838.

* ——— ——— Second edition, with additions. la. 8°. London, 1841.

|| **Riccò, A.**—Das Observatorium zu Catania und die Station auf dem Aetna. Nach dem italienischen Original übersetzt von P. Spies. la. 8°. [*Himmel u. Erde*, iv., 1892, *p.* 550.]

|| ——— Taches solaires et perturbations magnétiques en 1892. 4°. [*Compt. rend. acad. sc., Paris*, cxv., 1892, *p.* 595.]

|| ——— Terremoti, sollevamento ed eruzione sottomarina a Pantelleria nella seconda metà dell' ottobre 1891. 8°. Roma, 1892. (*Boll. Soc. Geogr. Ital.*, 1892, *Feb.*)

Riggenbach, A.—Die Geschichte der meteorologischen Beobachtungen in Basel. 4°. Basel, 1892.

Rio de Janeiro, Observatorio.—Annuario. 1892. Anno viii. sm. 8°. Rio de Janeiro, 1892.

Riposto, Osservatorio Meteorologico del R. Istituto Nautico.—Bollettino mensile. Anno xviii., 1892. Fasc. 1–12. sm. f°. Riposto, 1892.

|| **Rizzo, G. B.**—Di un notevole tipo isobarico subalpino. la. 8°. Torino, 1891. (*Atti R. Accad. Sc. Torino*, xxvi., 1891.)

|| ——— Il clima di Torino. Pubbl. R. Osserv. Astr. Torino. N. ii. sm. f°. Torino, 1893. (*Mem. R. Accad. Sc. Torino, ser.* ii., *tom.* xliii., 1892.)

Rome, Specola Vaticana.—Pubblicazioni. Fasc. ii. sm. f°. Roma, 1891.

——— **Ufficio Centrale Meteorologico e Geodinamico Italiano.**—Annali. Serie ii. Vol. x., 1888, Parti 1–4; xi., 1889, Parti 1–3. 7 vols. sm. f°. Roma, 1892–93.

——— ——— Bollettino meteorico. Anno xiv., 1892, Jan. 1—Dec. 31. la. 4°. Sheets.

——— ——— Rivista Meteorico-Agraria. Anno xiii., Nos. 1–36, 1892. la. 8°. (Roma, 1892–93.)

|| **Roscoe, H. E., and Stewart, B.**—On the heat of sunshine at London during the twenty years 1855 to 1874, as registered by Campbell's method. 8°. (*Proc. Roy. Soc.*, 1875, *p.* 578.)

|| **Rotch, [A.] L.**—Sur la mesure des hauteurs et des vitesses des nuages à l'observatoire de Blue-Hill (États-Unis). la. 8°. (*Assoc. franç. avanc. sc., Congr. de Marseille*, 1891.)

|| ——— Mountain meteorology. Extracts from a series of three lectures delivered before the Lowell Inst. of Boston in 1891. 2 papers. la. 8°. (*Amer. Meteor. Journ.*, 1891, *Aug.*, *p.* 145, *Sept.*, *p.* 193.)

|| ——— New high level meteorological observatories in France. la. 8°. (*Amer. Meteor. Journ.*, 1891, *Nov.*, *p.* 316.)

|| ——— The mountain meteorological stations of the United States. la. 8°. (*Amer. Metcor. Journ.*, 1892, *Jan.*, *p.* 396.)

|| **Rotch, [A.] L.**—The international meteorological conference at Munich. la. 8°. (*Amer. Meteor. Journ.*, 1892, *Feb.*, *p.* 433.)

|| **Russell, H. C.**—A cyclonic storm or tornado in the Gwydir district. 8°. [*Journ. R. Soc. N. S. Wales*, xxv., 1891.]

|| ——— Notes on the rate of growth of some Australian trees. 8°. [*Journ. R. Soc. N. S, Wales*, xxv., 1891.]

|| ——— Anniversary address. Delivered to the R. Soc. of N. S. Wales, May 4, 1892. 8°. Sydney, 1892. [*Journ. R. Soc. N. S. Wales*, xxvi., 1892.]

——— Physical geography and climate of New South Wales. Second edition. la. 8°. Sydney, 1892.

Russell, Hon. R.—Observations on dew and frost. la. 8°. London, 1892.

|| **Russell, W. J.**—A sketch of the chemical history of the air. 8°. (*Trans. San. Inst.*, xiii., 1892.)

St. Petersburg, Kaiserliche Akademie der Wissenschaften.—Repertorium für Meteorologie. . . . Redigirt von H. Wild. Bd. xv. sm. f°. St. Petersburg, 1892.

——— **Observatoire Physique Météorologique.**—Bulletin météorologique 1892, Jan. 1—Dec. 31. f°. Sheets.

In the Russian language also.

——— **Physikalisches Central-Observatorium.**—Annalen . . . herausgegeben von H. Wild. Jahrg. 1891. Theil i. und ii. 2 vols. sm. f°. St. Petersburg, 1892.

[——— **Scientific Department of the Naval Technical Committee.**]—Naval Repertory. 1891. Nos. 1-3, 7-9. 1892. Nos. 2-8, 10, 12. la. 8°. St. Petersburg, 1891-92.

In the Russian language.

|| **Sabine, Sir E.**—Obituary notice. 8°. (*Proc. R. Soc.*, li., 1892, *Obit. Not.*, p. xliii.)

San Fernando, Instituto y Observatorio de Marina.—Anales. Sección 2ª. Observaciones meteorológicas y magnéticas. Año 1891. f°. San Fernando, 1892.

Schlee, P.—Niederschlag, Gewitter und Bewölkung im südwestlichen und in einem Theile des tropischen Atlantischen Ozeans nach den meteorologischen Schiffsjournalen der Deutschen Seewarte. 4°. Halle a. s., 1892.

Schreiber, P.—Der Siebenschläfer und die durchschnittlichen Regenverhältnisse im Königreich Sachsen. la. 4°. (*Wissensch. Beilage der Leipziger Zeitung*, 1891, *No.* 84.)

|| ——— Untersuchung über das Wesen der sogenannten Bessel'schen Formel sowie deren Anwendung auf die tägliche periodische Veränderung der Lufttemperatur. la. 4°. Halle, 1892. (*Nova Acta k. leop.-carol. deutsch. Akad. Naturf.*, lviii., *Nr.* 3, *p.* 139.)

|| **Schück, A.**—Die Kompass-Sage in Europa (Flavio Gioja), die ersten Erwähnungen desselben dortselbst und nationale Ansprüche an seine Erfindung. la. 4°. Ausland, 1892, Nr. 35-39.

——— Magnetische Beobachtungen auf der Nordsee angestellt in den Jahren 1884 bis 1886, 1890 und 1891. la. 4°. Hamburg, 1893.

* **Scott, D. H.** The medical topography of Queenstown: being an examination into the climate, and the influence it exercises on disease, especially pulmonary. With some notice of the natural history of the locality. 4°. Cork, 1849.

|| **Scott, R. H.**—Atlantic weather and its connection with British weather. 8°. (*Journ. R. United Service Inst.*, xxxvi., 1892, *p.* 499.)

* ——— Notes on the climate of the British Isles. 8°. (*Longman's Mag.* 1892, *June*, *p.* 174.)

Seeland, F.—Magnetische und meteorologische Beobachtungen zu Klagenfurt. Dec. 1891—Nov. 1892 and year. 8°. s.l.e.a.

Shanghai, Inspectorate General of Customs.—List of the Chinese lighthouses, light-vessels, buoys, and beacons for 1893. 21st issue. 4°. Shanghai, 1893.

Singapore, Principal Civil Medical Officer, Straits Settlements.—Annual meteorological report, Straits Settlements, for the year 1891. f°. s.l.e.a.

|| **Singer, K.**—Wolkentafeln. la. 4°. München, 1892. (*Beob. Meteor. Stationen K. Bayern*, xiii., 1891, *Heft* 3.)

Text in English and French also.

* || **Steinmetz, A.**—Everybody's weather-guide. . . . 8°. London, 1867. (*Reprinted, with additions, from Colborn's United Service Mag.*)

Stockholm, Meteorologiska Central-Anstalt.—Månadsöfversigt af väderleken i Sverige till landtbrukets tjenst utgifven under meteorologiska Central-Anstaltens inseende af Dr. H. E. Hamberg. Årgång xii. 1892. f°. Stockholm, 1892.

Stonyhurst College Observatory.—Results of meteorological, magnetical, and solar observations. By the Rev. W. Sidgreaves. 1892. sm. 8°. Clitheroe, 1893.

The Appendix contains "Results of meteor. obsns. taken at St. Ignatius' College, Malta, by the Rev J. Scoles. 1892."

Straits Settlements.—Annual report on the State of Negri Sembilan for the year 1891. sm. f°. s.l.e.a.

——— Annual report on the State of Pahang for the year 1891, by J. P. Rodger. sm. f°. s.l.e.a.

——— Annual report on the State of Perak for the year 1891. By W. H. Treacher. sm. f°. Taipiug, 1892.

——— Annual report of the State of Selangor for the year 1891. By W. E. Maxwell. sm. f°. Kuala Lumpur, 1892.

——— Report on the medical department of the State of Sungei Ujong, for the year 1891, by W. L. Braddon. sm. f°. Singapore, [1892].

Strassburg, Meteorologischer Landesdienste in Elsass-Lothringen.—Ergebnisse der meteorologischen Beobachtungen im Reichsland Elsass-Lothringen im Jahre 1890. la. 4°. Strassburg, 1892.

Stuttgart, Königl. statistisches Landesamt.—Mitteilungen. iv. Jahrg. 1892, Nro. 1–12. la. 8°. Stuttgart, s.a.

Contains "Witterungsübersicht . . . nach den Beob. der württemb. meteor. Stationen."

——— **Meteorologische Centralstation.**—Deutsches meteorologisches Jahrbuch. Jahrg. 1891. Meteorologische Beobachtungen in Württemberg. Mitteilungen der mit dem Königlichen statistischen Landesamt verbundenen meteorologischen Centralstation. Bearbeitet von L. Meyer. la. 4°. Stuttgart, 1892.

Sundell, A. F.—Åskvädren i Finland. 1889. 1891. 2 parts. la. 8°. (*Bidr. Känn. Finl. Natur. o Folk*, li., *pp.* 89, 287.)

[Sydney Observatory.] — Meteorological observations at Sydney. 1891, Jan.—Dec. 8°. s.l.e.a.

[———] Results of meteorological observations made in New South Wales during 1880-82, 1883-84, 1889 under the direction of H. C. Russell. 3 vols. la. 8°. Sydney, 1891-92.

[———] Results of rain, river, and evaporation observations made in New South Wales during 1890: by H. C. Russell. la. 8°. Sydney, 1892.

——— **Royal Society of New South Wales.**—Journal and proceedings. Vol. xxv., 1891. 8°. Sydney, s.a.

Symons's Monthly Meteorological Magazine.—Vol. xxvii., 1892. 8°. London, 1893.

Symons, G. J., and Wallis, H. S.—British rainfall, 1891. On the distribution of rain over the British Isles, during the year 1891 . . . 8°. London, 1892.

For previous years, see SYMONS, G. J.

Tacubaya, Observatorio Astronómico Nacional.—Anuario. 1893. Año xiii. Formado bajo la dirección del Ingeniero A. Anguiano. sm. 8°. México, 1892.

Tananarive, Observatoire Royal de Madagascar.—Observations météorologiques faites à Tananarive par E. Colin. Vol. iii., 1891. 8°. Tananarive, 1892.

Tarner, G. E. — Detonation in meteorology. A short account of the first proposal in England of artificial detonation in the atmosphere, in 1880, and of subsequent steps for its adoption. 8°. London, 1892.

Tebbutt, J.—Report of Mr. Tebbutt's Observatory, the Peninsula, Windsor, New South Wales, for the year 1891. 8°. Sydney, 1892.

|| **Thomson, J.**—On the grand currents of atmospheric circulation. la. 4°. London, 1892. (*Phil. Trans., vol.* 183, 1892, *A. p.* 653.)

* **Thwaite, B. H.**—London fog: a scheme to abolish it. la. 8°. (*Nat. Rev.*, 1892, *Nov., p.* 360.)

|| **Tillmann, C.**—Beobachtungen über Gewitter in Bayern, Württemberg, Baden und Hohenzollern während des Jahres 1891. la. 4°. (*Beob. meteor. Stationen K. Bayern*, xiii., 1891.)

Tokio, Meteorological Central Observatory. — Weather maps. 1892. Jan.—Dec. 4°.

In the Japanese language also.

Tonga.—Statistics of the Tonga Islands for the year ended 31st December, 1891. sm. f°. Suva, 1892.

Contains meteor. obsns. for 1891.

Toronto, Magnetical Observatory.—General meteorological register for the year 1891. 8°. s.l.e.a.

——— **Meteorological Service, Dominion of Canada.**—Monthly weather review. 1892, Jan.—Dec. la. 4°. s.l.e.a.

——— ——— Report. . . By C. Carpmael. 1888. la. 8°. Ottawa, 1892.

Toynbee, H.—Weather forecasting for the British Islands. Read before the Shipmasters' Society, 18 Nov. 1892. 8°. London, 1892.

|| **Trabert, W.**—Der tägliche Gang der Temperatur und des Sonnenscheins auf dem Sonnblickgipfel. Vorgelegt in der Sitzung vom 15 Oct. 1891. la. 4°. Wien, 1892. (*Denkschr. math.-naturw. Cl. k. Akad. Wissensch.*, lix., *p.* 177.)

Trieste, I. R. Accademia di Commercio e Nautica.—Osservazioni meteorologiche instituite all' Osservatorio Marittimo. 1892, Jan.—Dec., and Results. oblong la. 8°. Sheets.

——— **Osservatorio Marittimo.**—Rapporto annuale . . . contenente le osservazioni meteorologiche e marcografiche di Trieste e le osservazioni meteorologiche di alcune altre stazioni Adriatiche per l'anno 1890. Redatto da E. Mazelle. Vol. vii. la. 4°. Trieste, 1892.

Trinidad, Royal Botanic Gardens.—Annual report on the Royal Botanic Gardens, and their work, for 1891. sm. f°. Port-of-Spain, 1892.

——— ——— Meteorological Returns. 1892, Jan.—Dec. sm. f°. Sheets.

|| **Tromelin, G. le G. de.**—Note sur les causes originelles des cyclones et leurs signes précurseurs. la. 8°. Paris, 1891. (*Rev. marit. et col.*, 1891, *Dec.*)

|| **Tromelin, [G.] le G. de.**—Lois mécaniques de la circulation de l'atmosphère. Surfaces isodenses. Grains. Circulations générales et secondaires. Mém. présenté à l'acad. sc. . . . 28 mars 1892. 8°. Paris, 1892. (*Revue scient.*, 3e *sér.*, 1892.)

|| **Turin, Osservatorio della R. Università.**—Osservazioni meteorologiche . . . . 1891 . . . . calcolate dal G. B. Rizzo. la. 8°. Torino, 1892. (*Atti R. Accad. Sc. Torino*, xxvii., 1892.)

——— **Reale Osservatorio Astronomico.** — Pubblicazioni. N. ii. See Rizzo, G. B.

——— **Società Meteorologica Italiana.**—Bollettino mensuale pubblicato per cura dell' Osservatorio Centrale del Real Collegio Carlo Alberto in Moncalieri. Serie ii., vol. xii. (della intera Collezione vol. xxvii.) 1892. sm. f°. Torino, 1892.

Upsala, Observatoire Météorologique de l'Université.—Bulletin mensuel. Vol. xxiii., 1891. Par H. H. Hildebrandsson. la. 4°. Upsal, 1891-92.

|| **Upton, W., and Rotch, A. L.**—Meteorological and other observations made in connection with the total solar eclipse of January 1, 1889, at Willows, California. la. 4°. Cambridge, 1892. (*Ann. Astr. Obs. Harvard Coll.*, xxix.)

Utrecht, Koninklijk Nederlandsch Meteorologisch Instituut.—Nederlandsch meteorologisch jaarboek. 1880, Deel ii., 1891. 2 vols. oblong 8°. Utrecht, 1892.

——— ——— Onweders in Nederland. 1890, 1891. Deel xi.-xii. 2 vols. la. 8°. Amsterdam, 1891.

|| **Veeder, M. A.**—The relation between sun-spots and auroras. 4°. Sheet. (*Astronomy and Astro-Physics, No.* 105.)

Veeder M. A.—Thunderstorms. la. 8°. (*Proc. Rochester Acad. Sc.*, ii., 1892, *p.* 134.)

|| ——— Solar electro-magnetic induction. la. 8°. Dated, Lyons, N. Y., 1893. (*Astronomy and Astro-Physics, No.* 113.)

Ventilation.—Report from the Select Committee on House of Commons (Ventilation); together with the proceedings of the Committee, minutes of evidence, appendix, and index. sm. f°. London, 1891.

|| **Vienna, Kais. Akademie der Wissenschaften.**—Berichte der Commission für Erforschung des Östlichen Mittelmeeres. Erste Reihe. la. 4°. (*Denkschr. k. Akad. Wissensch. Wien*, lix.)

——— **K. K. Central-Anstalt für Meteorologie und Erdmagnetismus.**—Beobachtungen. 1892, Jan.—Dec., and Results. 8°.

——— ——— Jahrbücher. Jahrg. 1890. Neue Folge xxvii. Bd. la. 4°. Wien, 1892.

——— ——— Telegrafischer Wetterbericht. Jahrg. xvi., 1892. Jan. 1—Dec. 31. la. 4°. Sheets.

——— **Kais. Königl. geographische Gesellschaft.**—Mittheilungen. 1891, 1892, xxxiv.-xxxv. Bd. (der neuen Folge xxiv., xxv.) 2 vols. la. 8°. Wien, 1891-92.

Volante, G.—Osservazioni meteorologiche fatte in Alessandria alla Specola del Seminario nell' anno 1891. Anno xxxiv. la. 8°. Alessandria, 1892.

Waldo, F.—Modern meteorology: an outline of the growth and present condition of some of its phases. sm. 8°. London, 1893.

Walker, A. O.—The climate of the North coast of Wales. 8°. Chester, 1893.

Ward, R. De C.—Thunderstorms in New England during the years 1886 and 1887. 2 papers. la. 8°. (*Amer. Meteor. Journ.*, ix., 1892, *pp.* 21 *and* 211.)

|| **Warsaw, Oddzial Warszawski Towarzystwa popierania Przemyslu i Handlu.**—Spostrzezenia meteorologiczne. 1886-1888. 3 vols. la. 8°. Warszawa, 1888, 1890. (*Odbitka z Pamietnika Fizyjogr.*, vii.-ix., 1887-1889.)

Washington, Department of Agriculture, Office of Experiment Stations.—Meteorological work for agricultural institutions. By M. W. Harrington. Experiment station Bulletin, No. 10. 8°. Washington, 1892.

——— ——— **Weather Bureau.**—Bulletin No. 1. Notes on the climate and meteorology of Death Valley, California. By M. W. Harrington. la. 8°. Washington, 1892.

——— ——— ——— Bulletin No. 2. Notes on a new method for the discussion of magnetic observations. By F. H. Bigelow. la. 8°. Washington, 1892.

——— ——— ——— Bulletin No. 3. A report on the relations of soil to climate. By E. W. Hilgard. la. 8°. Washington, 1892.

——— ——— ——— Bulletin No. 4. Some physical properties of soils in their relation to moisture and crop distribution. By M. Whitney. la. 8°. Washington, 1892.

——— ——— ——— Bulletin No. 5. Observations and experiments on the fluctuations in the level and rate of movement of ground-water on the Wisconsin Agricultural Experiment Station Farm and at Whitewater, Wisconsin, by F. H. King. la. 8°. Washington, 1892.

——— ——— ——— Monthly weather review. 1892. 4°. Washington 1892-93.

|| ——— ——— ——— Report of the Chief of the Weather Bureau for 1891. By M. W. Harrington. la. 8°. Washington, 1892. (*Rep. Sec. of Agric.*, 1891, *p.* 539.)

——— ——— ——— Weather map. 1892. Jan. 1—Dec. 31. la. f°. Sheets.

——— ——— ——— Wreck chart of the great lakes, showing the location of wrecks occasioned through founderings, gales of wind, fogs, and general stormy weather conditions from 1886 to 1891. la. f°. Sheet.

——— **Hydrographic Office.**—Pilot charts of the North Atlantic Ocean. 1892, Jan.—Dec. and supplements. Charts. la. f°.

——— **Signal Office.**—Charts showing maximum and minimum temperatures, by decades, for all years. la. f°. Dated, Washington, 1891.

——— ——— Diurnal fluctuations of atmospheric pressure at twenty-nine selected stations in the United States, by A. W. Greely. la. 4°. Washington, 1891.

Washington, Signal Office.—Irrigation and water storage in the arid regions. Letter from the Secretary of War transmitting a report of the Chief Signal Officer of the Army in response to House resolution dated May 23, 1890, relating to irrigation and water storage in the arid regions. 4°. Washington, 1891.

——— ——— Letter from the Acting Secretary of War, . . . transmitting a report of the Chief Signal Officer of the Army on the climatic conditions of the State of Texas. la. 4°. Washington, 1892.

‖ ——— ——— Report of Mr. O. L. Fassig, bibliographer and librarian. Extract No. 11, from Ann. Rep. of the Chief Signal Officer, 1891. 8°. Washington, 1892.

——— **Smithsonian Institution.**—Smithsonian contributions to knowledge. Vol. xxviii. la. 4°. Washington, 1892.

‖ ——— **United States Naval Observatory.**—Magnetic observations at the United States Naval Observatory, by J. A. Hoogewerff. 1890, 1891. 2 vols. la. 4°. Washington, 1891-92. (*Washington Obsns.*, 1887, 1888, *App.* 2.)

——— ——— Magnetic disturbances, 1892. la. f°. Sheet. s.l.e.a.

‖ ——— ——— Meteorological observations and results at the United States Naval Observatory, 1883-1887, 1888. 2 vols. la. 4°. Washington, 1891-92. (*Washington Obsns.*, 1887, *App.* 3, 1888, *p.* D 1.)

[——— **War Department.**]—Report of the Secretary of War; being part of the message and documents communicated to the two Houses of Congress at the beginning of the first Session of the fifty-second Congress. Vol. iv. House of Representatives, Ex. Doc. 1, Part 2. 8°. Washington, 1892.

Comprises "Rep. of the Chief Signal Officer for the year ending June 30, 1891."

‖ **Watts, F.**—The hurricane over the West Indies, August 18th-19th, 1891. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xviii, 1892, *p.* 185.)

Weiss, Edmund.—Berichte der zur Beobachtung der totalen Sonnenfinsterniss des Jahres 1868 nach Aden unternommenen österreichischen Expedition. v. Bericht. Beitrag zur Klimatologie von Aden. la. 8°. (*Sitzb. math.-naturw. Cl., Akad. Wien*, lviii., *Abth.* ii., *p.* 882.)

Wellington, Meteorological Office.—Annual rainfall (return of), in inches, for each year from 1864 to 1891 inclusive, with diagrams for the four principal stations. f°. Wellington, 1892.

‖ ——— ——— [Meteorological observations in New Zealand.] 1891. sm. f°. (*Statist. New Zealand*, 1891, *p.* 80.)

* **Wetter, Das.**—Meteorologische Monatschrift für Gebildete aller Stände. Herausgegeben von R. Assmann. ix. Jahrg., 1892. la. 8°. Braunschweig, 1892.

‖ **Whipple, G. M.**—On the rate at which barometric changes traverse the British Isles. la. 8°. (*Quart. Journ. Meteor. Soc.*, vi., 1880, *p.* 136.)

——— Composite portraiture adapted to the reduction of meteorological and other similar observations. la. 8°. (*Quart. Journ. Meteor. Soc.*, ix., *p.* 189.)

‖ ——— Results of a comparison of Richard's anémo-cinémographe with the standard Beckley anemograph at the Kew Observatory. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xviii., 1892, *p.* 257.)

‖ **Wild, H.**—Instrument für erdmagnetische Messungen und astronomische Ortsbestimmungen auf Reisen. la. 4°. St. Petersburg, 1892. (*Repert. Meteor.*, xvi., *No.* 2.)

‖ ——— Die Normalbarometer des Physikalischen Central-Observatoriums zu St. Petersburg. sm. f°. St. Petersburg, 1892. (*Repert. Meteor.*, xvi., *No.* 4.)

‖ ——— Über die Darstellung des täglichen Ganges der Lufttemperatur durch die Bessel'sche Interpolationsformel. Lu le 2 décembre 1892. sm. f°. St. Pétersbourg, 1893. (*Mél. phys. chim.*, xiii., *livr.* 2.)

‖ **Wilson, W. E., and Rambaut, A. A.**—The absorption of heat in the solar atmosphere. 8°. Dublin, 1892. (*Proc. R. Irish Acad.*, 3*rd ser.*, ii., *p.* 299.)

Wiltshire Rainfall.—1892. oblong 8°. Marlborough, 1893.

‖ **Woeikof, A.**—Klima des Puy de Dome in Central-frankreich. la. 8°. (*Meteor. Zeitschr.*, 1892, *Oct.*, *p.* 361.)

‖ **Wollny, E.**—Untersuchungen über die Bildung und die Menge des Thaues. 8°. (*Forschunyen auf dem Geb. Agrik.-phys., Heidelberg*, xv., *Heft* 1, 2.)

* **Yeo, J. B.**—Climate and health resorts. New and cheaper edition, with an appendix. sm. 8°. London, 1890.

York, Yorkshire Philosophical Society.—Annual report . . . . for 1891. la. 8°. York, 1892.

Zi-ka-wei, Observatoire Magnétique et Météorologique. — Bulletin mensuel. Tome xvii., 1891. sm. f°. Zi-ka-wei, 1892.

Zürich, Schweiz. Departement des Innern.—Graphische Darstellung der schweizerischen hydrometrischen Beobachtungen. 1892. la. f°. Sheets.

For the second half of the year the title is in French.

——— ——— Tabellarische Zusammenstellung der Haupt-Ergebnisse für das Jahr 1889. f°. Bern, s.a.

In the French language also.

——— **Schweizerische Meteorologische Central-Anstalt.** — Annalen. 1890. Der "Schweiz. meteor. Beob." xxvi. Jahrg. 4°. Zürich, s.a.

——— Wetterbericht. 1892, Jan. 1—Dec. 31. sm. f°. Sheets.

APPENDIX XVI.

ACCOUNT of RECEIPTS and PAYMENTS for the year ending 31st March 1893.

RECEIPTS.	£ s. d.	£ s. d.	PAYMENTS.	£ s. d.	£ s. d.
Balance from year 1891–92 -		1,703 7 10	ADMINISTRATION:		
Parliamentary Vote - -		15,300 0 0	Payment of Council -	993 15 0	
Repayment of expenses charged under—			Secretary - -	800 0 0	
(1.) Incidental expenses -	7 8 8		Salaries and wages -	793 0 0	
(2.) Expenses incidental to International Meteorological Congress -	1 8 0		Rent, fuel, and lighting	731 6 9	
(3.) Observatories	32 4 1		Incidental and contingent expenses :—		
		41 0 9	Attendance, cleaning, &c. - -	375 5 4	
SUPPLY OF INFORMATION:			Furniture and fittings	141 0 0	
Daily Weather Charts and Forecasts -	285 11 3		Expenses incidental to International Meteorological Congress - -	2 8 0	
6 p.m. Charts -	25 0 0		Pensions - -	186 16 4	
Reports for Press Agencies, &c.	91 0 7				4,023 11 5
Telegrams -	197 3 3		SPECIAL RESEARCHES	- - -	878 19 8
		598 15 1	LAND METEOROLOGY:		
SALE OF INSTRUMENTS, &c.:			Observatories and stations - -	2,737 5 8	
Royal Navy account -	14 13 1		Salaries: —Discussion and reduction of observations - -	1,274 15 2	
Mercantile Marine account -	19 4 4				4,012 0 10
M.O. (Stations) account -	26 0 0		WEATHER INFORMATION AND FORECASTS:		
		59 17 5	Telegraphic reports and storm warnings, &c.	2,616 19 0	
Commissions executed for Colonial and Foreign Institutions, &c. - -		352 8 3	Salaries : — Preparation and issue of reports and forecasts -	1,829 15 9	
Commission charged on work done for Colonies, &c. -		17 3 7			4,446 14 9
			INSPECTIONS:		
			Salaries and travelling expenses - -	- - -	487 7 1
			OCEAN METEOROLOGY:		
			Salaries :—Discussion and reduction of observations - -	1,656 1 10	
			Expenses incidental to the supply of instruments :—		
			Proportion for care and issue of instruments - -	200 0 0	
			Royal Navy - -	329 6 11	
			Mercantile Marine -	268 15 10	
			Distant island and coast stations -	22 8 2	
					2,476 12 9
			Commissions executed for Colonial and Foreign Institutions, &c. - -	- - -	246 18 8
			BALANCE:		
			Cash at Bank -	1,399 8 3	
			„ at Office -	80 19 11	
			Advance for travelling expenses - -	20 0 0	
					1,500 8 2
	£	18,072 12 11		£	18,072 12 11

In the year 1892–93 the sum of 1,551*l.* 2*s.* 11*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, rental of private wires, &c.

APPENDIX XVII.

LIST OF PUBLICATIONS, &c. issued under the Authority of the Meteorological Council.

OFFICIAL.

No. 1. Report of the Meteorological Committee for 1867. 1*s.*
2. Instructions for Meteorological Telegraphy. New Edition, 1891. Prepared for the use of observers exclusively.
3. Fishery Barometer Manual. (New edition, 1887.) 6*d.*
4. Charts showing the Surface Temperature of the South Atlantic Ocean in each Month of the Year. 2*s.* 6*d.*
5. Report of the Meteorological Committee for 1868. 5*d.*
6. Report of the Meteorological Committee for 1869. 10*d.*
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5*s.* each.
8. Barometer Manual. (Out of print. See Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5*s.* each.
10. Report of the Meteorological Committee for 1870. 10*d.*
11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2*s.* 6*d.*
12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2*s.* 6*d.*
13. A Discussion of the Meteorology of that Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. With Book of Charts, 5*s.*
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s.* each.
15. Report of the Meteorological Committee for 1871. 10*d.*
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5*s.* each.
17. Report of the Meteorological Committee for 1872. 1*s.*
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2*s.*
19. Quarterly Weather Report for 1873.—Parts I. to IV. 5*s.* each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20° — 30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20*s.*
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1873. 1*s.*
22. Report of the Meteorological Committee for 1873. 4*d.*
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2*s.*
24. Instructions in the Use of Meteorological Instruments. [Reprinted 1892.] 2*s.* 6*d.*
25. Quarterly Weather Report for 1874.—Parts I., II., and IV., 5*s.* each. Part III., 5*s.* 9*d.*
26. Report of the Meteorological Committee for 1874. 6*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. 24*s.*

28. Contribution to the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger.* 1*s.*

29. Report of the Meteorological Committee for 1875. 4*d.*

30. Quarterly Weather Report for 1875.—Parts I.—IV. 5*s.* each.

31. Report of the Meteorological Committee for 1876–7. 3*s.* 5*d.*

32. The Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. With Book of Charts. 15*s.*

33. Quarterly Weather Report for 1876 (New Series).—Part I., 6*s.*; Parts II., III., and IV., 5*s.* each.

*33A. Meteorological Observations at Stations of the Second Order for the year 1876.

33B. Meteorological Observations at Stations of the Second Order for the year 1877.

34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Vol. I.: Part I., 2*s.*; Part II., 10*s.*; Part III., 6*s.*; Part IV., 5*s.*; Part V., 6*s.*

35. Report of the Meteorological Council for 1877–8. 1*s.*

36. Report of the Proceedings of the Second International Meteorological Congress at Rome, 1879. 1*s.* 6*d.*

37. Report on the Meteorology of Kerguelen Island. By Rev. S. J. Perry, S.J., F.R.S. 3*s.*

38. Report of the Meteorological Council for 1878–9. 5*d.*

39. Meteorological Observations at Stations of the Second Order for the year 1878. 20*s.*

40. Aids to the Study and Forecast of Weather, by W. Clement Ley, M.A. 1*s.*

41. Report of the Meteorological Council for 1879–80. 1*s.*

42. Report of the Meteorological Council for 1880–81. 1*s.* 2*d.*

43. Meteorological Charts for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Charts, 25*s.*; Remarks, 7*s.*

44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E., by Capt. H. Toynbee, F.R.A.S. 7*s.* 6*d.*

45. Meteorological Observations at Stations of the Second Order for the year 1879. 20*s.*

46. Report on the Storm of October 13–14, 1881. By Robert H. Scott, F.R.S. 1*s.* 6*d.*

47. Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. 7*s.* 6*d.*

48. Report of the Meteorological Council for 1881–2. 1*s.*

49. Quarterly Weather Report for 1879. (New Series.) Parts I., II., and III., 6*s.* each; Part IV., 5*s.* 6*d.* Appendices and Plates. 27*s.*

50. Quarterly Weather Report for 1880. (New Series.) Parts I. and II., 6*s.* each; Part III., 4*s.*; Part IV., 6*s.* Appendices and Plates. 28*s.*

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* The Observations at Stations of the Second Order for the years 1873–1875 will be found in the Quarterly Weather Report for the respective years.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 51.* Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1881. (New Series.) Part I., 10*s.* 6*d.* Parts II., III., and IV., 21*s.* each.

52. Quarterly Weather Report for 1877. (New Series.) Part I., 10*s.*; Part II., 5*s.*; Part III., 4*s.* 6*d.*; Part IV., 6*s.* Appendices and Plates. 27*s.*

53. Meteorological Atlas of the British Isles. 5*s.* 6*d.*

54. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1882. Parts I. and II., 20*s.* each; Part III., 22*s.* 6*d.*; Part IV., 26*s.*

55. Quarterly Weather Report for 1878. (New Series.) Parts I., II., III., and IV., 6*s.* each. Appendices and Plates. 28*s.*

56. Sunshine Records of the United Kingdom for 1881. 4*s.*

57. Meteorological Observations at Stations of the Second Order for the year 1880. 34*s.* 6*d.*

58. Report of the Meteorological Council for 1882–3. 10½*d.*

59. Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. 21*s.*

60. Principles of Forecasting by means of Weather Charts. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition, revised.) 2*s.*

61. A Barometer Manual for the Use of Seamen. 1*s.* 3*d.*

62. Monthly Weather Reports for 1884. Jan., Feb., March, May —Nov., 1*s.* 6*d.* each. April (with 2 Appendices), 2*s.* 6*d.* Dec., 1*s.* 9*d.*

63. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1883. Parts I., II., and III., 21*s.* each; Part IV., 30*s.*

64. Report of the Meteorological Council for 1883–4. 1*s.* 2*d.*

65. Monthly Weather Reports for 1885. Jan. to Dec., 1*s.* 6*d.* each.

66. Meteorological Observations at Stations of the Second Order for the year 1881. 35*s.*

67. Report of the Meteorological Council for 1884–5. 4*s.* 4*d.*

68. Monthly Weather Reports for 1886. Jan. to Dec., 1*s.* 6*d.* each.

69. Meteorological Observations at Stations of the Second Order for the year 1882. 35*s.*

70. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1884. Part I., 12*s.*; Part II., 10*s.*; Part III., 10*s.* 6*d.*; Part IV., 15*s.*

71. Synchronous Weather Charts of the North Atlantic and the adjacent Continents. Aug. 1, 1882, to Sept. 3, 1883. Parts I. to IV. (33 sheets each.) 17*s.* each.

72. Report of the Meteorological Council for 1885–86. 8*d.*

73. Meteorological Observations at Stations of the Second Order for the year 1883. 30*s.*

74. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1885. Parts I. and II., 11*s.* each; Part III., 10*s.* 6*d.*; Part IV., 12*s.*

* For the years 1874–1880 the Hourly Readings were issued in lithographed form. Price 20*s.* per annum.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 75. Report of the Meteorological Council for 1886–87. 8*d.*

76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10*s.* 6*d.* Supplementary Chart, 6*d.*

*77. Monthly Weather Reports for 1887. January to April, 1*s.* 6*d.* each. May to December, in wrapper, 12*s.*

78. Meteorological Observations at Stations of the Second Order for the year 1884. 32*s.*

79. Report of the Meteorological Council for 1887–88. 1*s.*

80. Daily Weather Charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. 10*s.*

81. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1886. Parts I., II., and III., 10*s.* 6*d.* each. Part IV., 12*s.* 6*d.*

82. Meteorological Observations at Stations of the Second Order for the year 1885. 31*s.*

83. Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and the Army Medical Department. 1852–1886. 23*s.*

84. Report of the Meteorological Council for 1888–89. 5½*d.*

†85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4*d.* per week. With Appendices and Monthly Supplements, priced separately.

86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

87. Weekly Weather Report for the year 1890. Vol. VII. Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

88. Meteorological Observations at Stations of the Second Order for the year 1886. 25*s.*

89. Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo. 1886–88. By the late W. Reid, M.D. 8*s.* 6*d.*

90. Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. 7*s.*

91. Report of the Meteorological Council for 1889–90. 7½*d.*

92. Meteorological Charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras Hafún. 6*s.*

93. Harmonic Analysis of Hourly Observations of Air Temperature and of Pressure at British Observatories. 12*s.*

94. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1887. 16*s.*

95. Meteorological Observations at Stations of the Second Order for the year 1887. 24*s.*

96. Weekly Weather Report for the year 1891. Vol. VIII., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual subscription, including Supplements and Appendices, post paid, 30*s.*

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* Publication continued after this year as a Supplement to the Weekly Weather Report.

† The publication of the Weekly Weather Report began in February 1878. Annual subscription, 1878–1883, 12*s.* 6*d.*; 1884–1887, 21*s.* 2*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 97. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1888. 20*s.*

98. Ten Years Sunshine in the British Isles, 1881–90. 2*s.*

99. Report of the Meteorological Council for 1890–91. 5½*d.*

100. Weekly Weather Report for the year 1892. Vol. IX., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, Post paid, 30*s.*

101. Meteorological Observations at Stations of the Second Order for the year 1888. 22*s.*

102. Report of the International Meteorological Conference at Munich in 1891. 1*s.* 6*d.*

103. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1889. 15*s.*

104. Report of the Meteorological Council for 1891–92. 6*d.*

105. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1890. 20*s.*

106. Wind and Current Charts of the Red Sea. (In the Press.)

107. Weekly Weather Report for the year 1893. Vol. X., Third Series. 6*d.* per week. With Appendices and Monthly Supplements priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30*s.*

108. Meteorological Observations at Stations of the Second Order for the year 1889. (In the Press.)

109. Report of the Meteorological Council for 1892–93.

NON-OFFICIAL.

No. 1. Report of an Inquiry into the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6*d.*

2. Report to the Committee of the Meteorological Office on the Meteorology of the North Atlantic.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

3. Report to the Committee of the Meteorological Office on the Use of Isobaric Curves.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6*d.*

5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6*d.*

6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1872. 1*s.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 7. Notes on the Form of Cyclones in the Southern Indian Ocean. — By C. Meldrum, M.A., F.R.S. [Out of Print.]

8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 1873. 6*d.*

9. Report of the Permanent Committee of the First International Meteorological Congress at Vienna for 1874. 1*s.* 6*d.*

10. On the Physical Geography of the part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875.—By Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s.* 6*d.*

11. Report of the Permanent Committee of the First International Congress at Vienna for 1876. With Supplement. 2*s.*

12. Reports to the Permanent Committee of the First International Meteorological Congress at Vienna on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s.*

13. Report of the Permanent Committee of the First International Congress at Vienna for 1878. 6*d.*

14. Report of the International Meteorological Committee. Meeting at Berne, 1880. 1*s.*

15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. 2*s.* 6*d.*

16. Report of the Third Meeting of the International Meteorological Committee, held at Paris, September 1885. 1*s.*

17. Report of the Fourth Meeting of the International Meteorological Committee, held at Zürich, September 1888. 4*d.*

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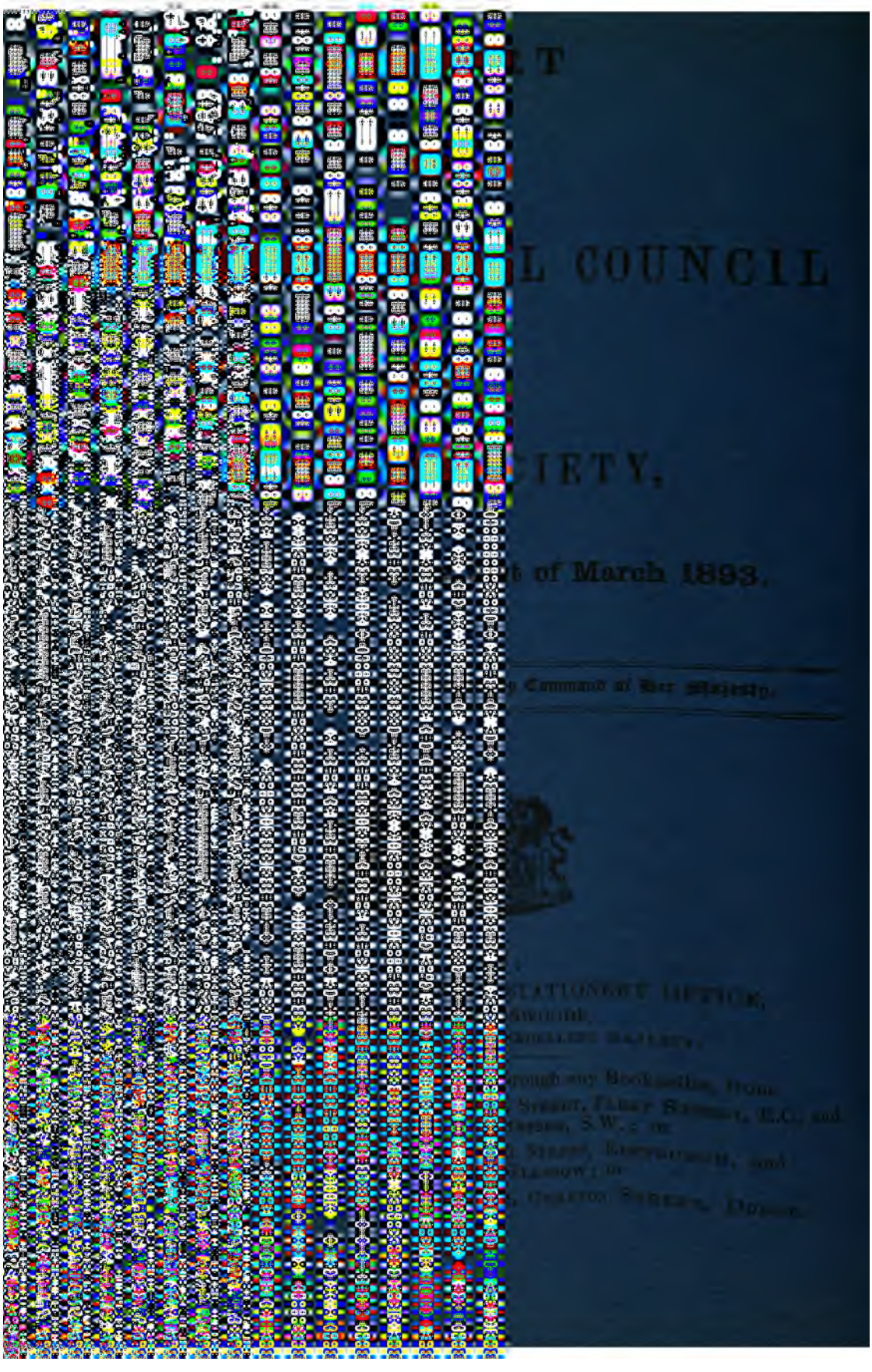

REPORT

OF THE

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TO THE

SOCIETY,

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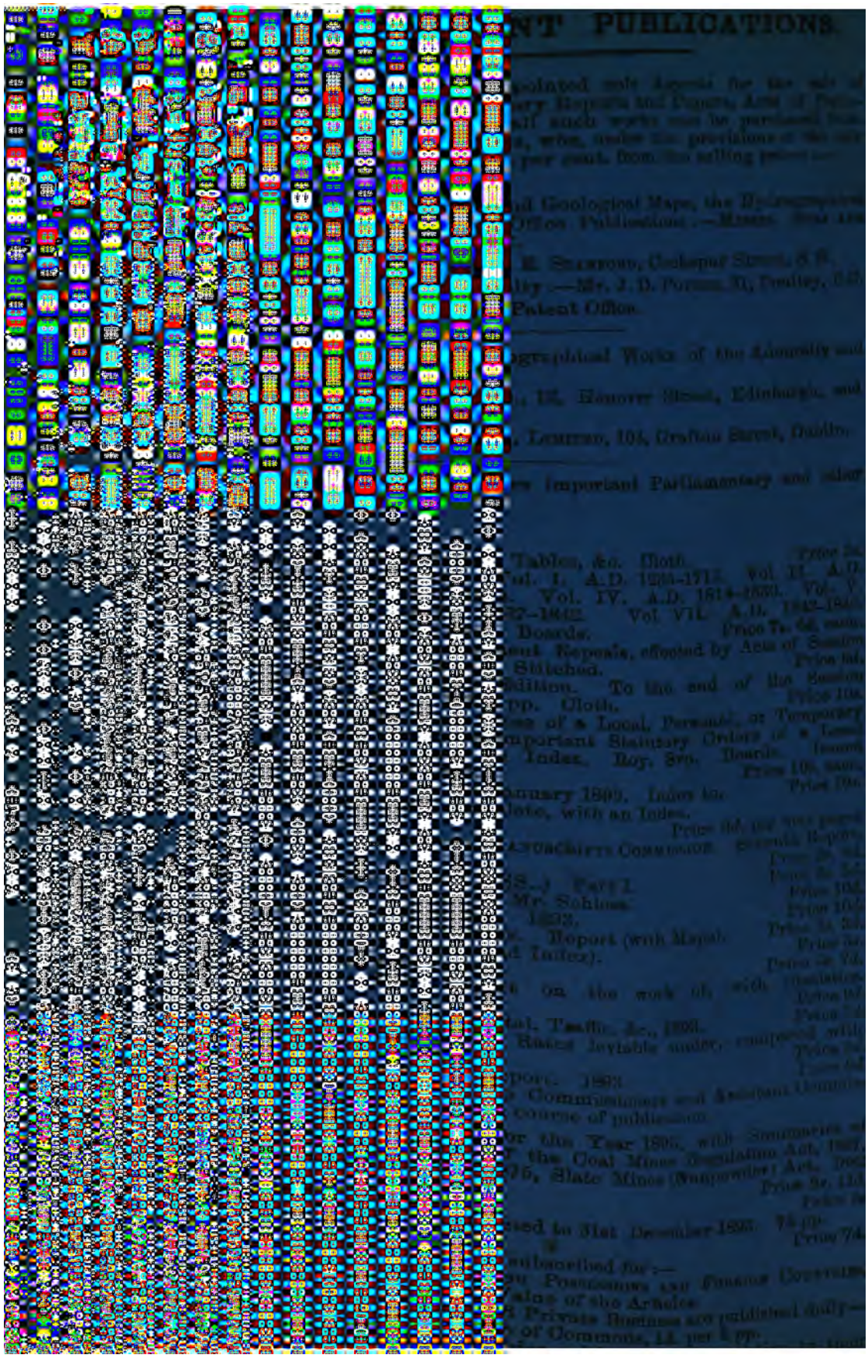

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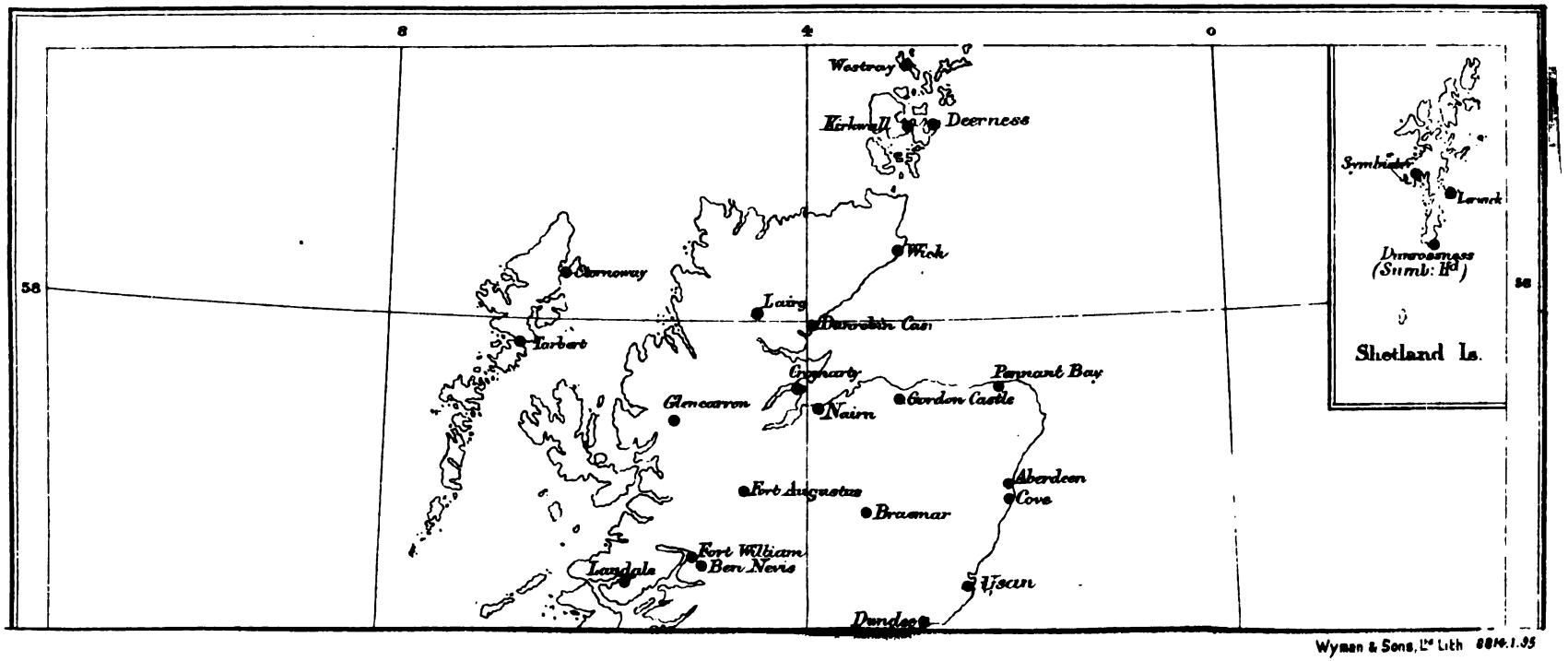

For details of Information Received.—See Appendix XI.

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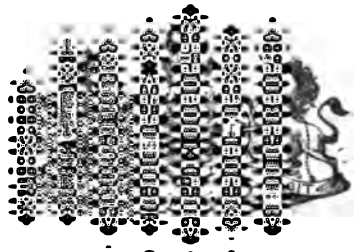

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THE METEOROLOGICAL COUNCIL,

1893–94.

Lieutenant-General Richard Strachey, R.E., C.S.I., LL.D., F.R.S., Chairman.

Mr. Alexander Buchan, M.A., LL.D., F.R.S.E.

Professor George Howard Darwin, M.A., LL.D., F.R.S.

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Mr. Edward J. Stone, M.A., F.R.S.

Captain William J. L. Wharton, R.N., F.R.S., Hydrographer of the Admiralty.

REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1894.

Introductory.

THERE has been no change in the Council during the year. The executive officers are, as stated in the last Report:—

Mr. R. H. Scott, M.A., F.R.S., Secretary.
Nav.-Lieut. C. W. Baillie, R.N., F.R.A.S., Marine Superintendent.

The Report is, as usual, divided into four sections or parts:

I. OCEAN METEOROLOGY.
II. WEATHER TELEGRAPHY.
III. LAND METEOROLOGY.
IV. MISCELLANEOUS.

PART I.

OCEAN METEOROLOGY.

Collection of information.

Collection of Information.—The practice followed by the Office in the collection of information has been to supply observers with a complete outfit of verified instruments, on the condition of their returning the instruments, and the log of observations made with them, to the Office at the completion of the voyage.

The instruments supplied are:—
One barometer; six thermometers, with a screen; four hydrometers.

The first record of observations is made in a rough book supplied for the purpose, which is retained by the Captain, who copies the observations into a regular form of log kept for the Office. As regards the Royal Navy, Her Majesty's ships are supplied by the Office with the meteorological instruments used in the Service, and the Council are glad to say that they receive from time to time meteorological logs of high value from this source.

In order to facilitate the communications between the Office and the observers, agencies are established at some of the principal ports, and instruments are supplied direct from them to the ships.

Collection of information.

The following is a list of the agents at present in connexion with the Office:—

Aberdeen, J. R. Jones, Navigation School.
Cardiff, T. S. Ainsley, Bute Docks.
Dundee, Capt. A. Wood, Navigation School.
Glasgow, Messrs. D. McGregor and Co., Clyde Place.
Greenock, Messrs. D. McGregor and Co., Brymner Street.
Hull, Z. Scaping, Trinity House.
Liverpool, J. Gill, Nautical College.
Southampton, Capt. D. Forbes, High Street.

Occasionally captains are supplied at ports where there are no agencies, and in these cases the instruments are sent direct from the Office in London.

A set of instruments is kept in working order at the Office in London, and at each agency, for the purpose of instructing observers in the handling and reading of all the instruments. A notice to captains is frequently distributed to vessels lying in the various London docks, and copies of it are also supplied to each agent for circulation.

Various publications (see pp. 94–99) are presented by the Council to observers who supply the Meteorological Office with thoroughly well kept logs, in recognition of their co-operation in a work which is calculated to be of very great advantage to navigators and to science generally.

Recognition of "excellent" observers.

Appendix I. (p. 23) contains a list of all the observers who during the past year have contributed logs classed as "excellent." Several of these observers have regularly co-operated with the Office for many years. The names which appear in the list for the first time are as follow:—

Observer's Name.	Ship.
Alford, F.	S.S. "Monarch."
Campbell, J. J. W. (Surgeon)	S.S. "Diana."
Chesshire, G. H.	S.S. "Aldgate."
Cust, H. E. P., R.N.	H.M.S. "Dart."
Davidson, D. C.	"Loch Rannoch."
Davidson, R.	S.S. "Diana."
Davis, G. W.	S.S. "Alberta."
Elliott, C.	S.S. "Wilcannia."
Fraser, C.	S.S. "Massilia."
Lewes, P. V., R.N.	H.M.S. "Blanche."
Lindley, G. R., R.N.	H.M.S. "Blanche."
McKinstry, E. R., R.N.R.	S.S. "Germanic."
Marescaux, A. E. H., R.N.	H.M.S. "Dart."
Margesson, W. H. D., R.N.	H.M.S. "Egeria."
Murray, R. G., R.N.R.	S.S. "Britannia."
Nicol, R.	S.S. "Germanic."
Pentin, W.	S.S. "Wilcannia."
Philip, W., Junr.	"Salamis."
Robertson, T.	S.S. "Active."
Smith, J.	S.S. "Dunera."

The total number of Meteorological logs received in the year ending March 31, 1894, was 151, of which 139, or 87 per cent., have been classed as either "excellent" or "very good." Characters of logs received.

The Council have also received, through the Ocean Steamship Company of Liverpool, a considerable number of ships logs, mostly from voyages to and from the China Seas, viâ Suez.

The Council take this opportunity of expressing their best thanks to the observers who have assisted them during the past year.

They regret to have to announce the deaths of two of their observers; Captain John Gray, who had supplied most valuable information in the logs of his numerous whaling and sealing voyages, and Captain J. E. Thompson of the "Monarch," H.M. Cable Ship.

Appendix II. (p. 25) gives a list of the meteorological logs and of meteorological reports from stations abroad, received at the Office during the year.

The following summary of the voyages of the ships observing for the Office shows the districts from which observations were received during the year:— Districts from which observations are obtained.

To Baffin's Bay or Greenland	3
„ North America, East Coast	16
„ „ „ West „	9
Off East Coast of North America	3
To West Indies	5
„ South America, East Coast	11
„ „ „ West „	5
„ Australia and New Zealand, viâ Cape of Good Hope	32
„ „ „ viâ Suez	9
At Australian stations	2
To India, viâ Suez	12
„ India, viâ Cape of Good Hope	14
„ China, viâ Suez	5
In China Seas	2
To Cape of Good Hope and East Coast of Africa	7
Off East Coast of Africa	3
To Antarctic Seas	4
To Mediterranean Ports	3
Between British Ports	4
To Continental Ports	2

Red Sea Charts.—These charts have now been all completed, and the work will be issued in the course of the year.

Current Charts for all Oceans.—In the Council's Report for the year 1892 it was stated that a considerable amount of information, some 25,000 observations in all, had been obtained from foreign authorities in order to supplement the records of currents derived from English sources of information. During the year now under review a further instalment of some 2,000 observations for the Pacific Ocean has been obtained from Germany, exhausting their data, and the Council are of opinion that they have now procured nearly all the trustworthy current observations in existence, at least in the archives of the various meteorological Current charts for all oceans.

Current charts.

bureaus in Europe. The somewhat difficult task of preparing the data thus collected for publication is now being undertaken, for which purpose generalised results, indicating the most probable set of the currents, have to be obtained from a multitude of separate and often divergent observations, an operation requiring the exercise of much care and judgment.

The Meteorology of the South Sea.—This investigation has made steady progress during the year, but none of the final charts have as yet been placed in the engraver's hands.

The South Atlantic and West Coast of South America.—The preparation of logs and extraction of data for this district, extending from 10° E. to 100° W. Longitude, is being actively prosecuted. In the South Sea, the southern limit of the area to be discussed is given by the northern limit of the South Polar Ice.

Stock of instruments belonging to the Office.

Supply and Stock of Instruments.—In Appendix III. (p. 31) is given a list of the meteorological instruments supplied by the Office to ships in the Royal Navy during the year, with a statement for the 31st March 1894 of the stock and distribution of the instruments standing on the books to the account of the Admiralty. The recent augmentation of the number of ships in commission and in reserve has led to the necessity of providing a considerably larger stock of instruments than had been required in former years.

Appendix IV. (p. 32) gives similar information with regard to the disposal of the other instruments belonging to the Office, remaining in store, or which have been supplied to the Mercantile Marine, and to observatories, telegraph stations, &c.

PART II.

Weather Telegraphy and Forecasts.

Administrative.

There have been no serious interruptions of telegraphic communication during the year, excepting that the cable to Jersey broke down in January, and communication was not restored for a fortnight.

Among the observers the changes have been numerous. At Holyhead Mr. T. Chope has succeeded Captain S. Richards, at Hurst Castle Mr. E. T. Tremble has succeeded Mr. G. G. Appleton, at Parsonstown Mr. J. Perry has succeeded his brother Mr. W. J. Perry, at Pembroke Mr. S. Blake has been succeeded by Mr. Knott, and at Prawle Point Mr. W. Hewitt by Mr. Michael Holmes.

Daily and Weekly Weather Reports.

A list of the British telegraphic reporting stations is given in Appendix XI. (p. 64), and Foreign stations in Appendix XI. (p. 68).

An important addition has been made during the year to the information received from foreign stations, the Portuguese Meteorological Office having commenced the daily transmission of reports from two stations in the Azores.

The work in this branch of the Office continues to increase. The Daily and Weekly Weather Reports, in particular, have been extended and improved.

Inspection of the Stations.

Inspection of the Telegraphic Reporting Stations.—The telegraphic reporting stations have been inspected during the year, in England by Mr. Ley, in Scotland by Mr. Buchan, and in Ireland and Wales by Mr. Scott. The reports submitted by the Inspectors to the Council, which are printed in Appendix V. (p. 33), show that the efficiency of the service continues to be satisfactorily maintained.

Discussion of the reports.

Discussion and Publication of the Information received.—The practice of the Office in collecting, discussing, and disseminating the meteorological information received by telegraph is described in Appendix X. of the Report for 1891. The Daily Weather Report has appeared regularly during the year; for details see that Appendix. It is distributed free of cost a follows:—To newspapers, seven copies; to seaports, for public exhibition, 71 copies; to Government offices and public institutions, 79 copies; to correspondents of the Office, 61 copies; and to foreign meteorological establishments, 35 copies. Nearly 200 copies are issued regularly to subscribers.

Distribution of reports.

The Weekly Weather Report, with its Monthly Appendices, has also appeared regularly; for particulars of this publication see Appendix VI. (p. 52).

Display of information in front of the Office.

Public display at the Meteorological Office in London of the State of the Weather on British Coasts.—This arrangement, which was made with a view to the earliest possible supply to the public of the latest information as to the weather received from the principal points on the eastern, southern, and western coasts, has been regularly carried out, and it is believed with general public approval. It supplies at 9.30 a.m. and 3 p.m. every week day the substance of the reports received by telegraph, of the state of the weather and sea at the following stations: Yarmouth, Dungeness, the Needles (Hurst Castle), Scilly, Holyhead, and Valencia, and this is displayed in a conspicuous manner on the front of the Office, 63, Victoria Street, S.W.

Forecasts for the Fleet.

Supply of Forecasts to the Fleet.—At the request of the Admiralty daily forecasts were supplied to the Commander-in-Chief of the "A" Fleet during the continuance of the Manœuvres, as in previous years, and also to the Commander-in-Chief, Devonport. This latter service is continued throughout the year. It commenced at the end of 1890.

Forecasts.

Weather Forecasts.—Forecasts are prepared three times a day, namely, at 11 a.m., at 3.30 p.m., and 8.30 p.m. The Forecasts prepared at 11 a.m., on the information derived from the 8 a.m. reports, refer to the probable weather between noon on the day of issue and noon on the following day. They are publicly

exhibited in several places in London,* and are supplied to the afternoon editions of the newspapers. The 3.30 p.m. Forecasts are employed for storm warnings only, excepting in the hay harvest season, when they are issued as subsequently explained. The forecasts at 8.30 p.m. are specially prepared for publication in the morning newspapers, but all the forecasts are available for the information of anyone who applies for them at the Office.

Inquiries at the Office.

The inquiries received through the Post Office for special forecasts during the year amounted to 75, and the personal applications to 74. The rules of the Office relating to such inquiries are stated in Appendix VI., p. 55.

Results of Forecasts.

The results of a comparison of the Forecasts issued at 8.30 p.m. during the year, with the weather actually experienced, are given in Appendix VII. (p. 56). The following summary shows the successes and failures over the whole United Kingdom, estimated as explained in that Appendix.

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1893–94.

Districts.	Per-centages.				Total per-centage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	59	26	10	5	85
„ E. - -	57	27	10	6	84
ENGLAND, N.E. - -	59	26	12	3	85
„ E. - -	61	26	10	3	87
MIDLAND COUNTIES -	60	24	12	4	84
ENGLAND, S. - -	65	24	9	2	89
SCOTLAND, W. - -	57	23	13	7	80
ENGLAND, N.W. -	59	24	11	6	83
„ S.W. -	60	23	11	6	83
IRELAND, N. - -	57	26	9	8	83
„ S. - -	55	27	10	8	82
Summary - -	59	25	11	5	84

* Note "partial" implies "more than half."

Testing of Forecasts.

The following table shows for each year from 1884 to 1893, inclusive, the per-centages of complete and partial success of the Forecasts issued at 8.30 p.m. for the whole year. It will be seen that the total for "complete success" was highest in 1893.

* Viz., in the City at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's Cornhill, and Messrs. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and the House of Commons; at Messrs. Elliot's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and Messrs. Pastorelli's, New Bond Street; and at the Office, 63, Victoria Street.

PER-CENTAGES of RESULTS of FORECASTS for the whole of the BRITISH ISLES.

Year.	Complete Success.	Partial, *i.e.*, more than Half Success.	Total Success.
1884	50	31	81
1885	50	34	84
1886	49	31	80
1887	52	32	84
1888	51	31	82
1889	49	32	81
1890	50	32	82
1891	50	30	80
1892	46	33	79
1893	59	25	84
Average	51	31	82

Hay Harvest Forecasts.

Hay Harvest Forecasts.—The Council renewed in 1893 the offer made in previous years to the Royal Agricultural Society, the Royal Dublin Society, and the Highland and Agricultural Society to send Daily Forecasts *gratis* during the haymaking season to a number of observers selected by those Societies, on two conditions, viz., that the information should be made known as widely as possible, and a record of the weather actually experienced sent weekly to the Office. The Societies accepted the proposal, and the Forecasts were issued as shown in the following table:—

LIST of those who received HAY HARVEST FORECASTS in 1893.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass	Golspie.
	Major Smith	Munlochy, Inverness.
1. SCOTLAND, E.	T. Wilson	Glamis Castle, by Forfar.
	C. Pirrie	Rothiemay, Huntly.
	T. Bett	Dalnaline, Aberfeldy.
2. ENGLAND, N.E.	Sir J. Wilson	Chillingham Barns, Chatton, Northumberland.
	J. Turner	The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck	High House, Thorpe, Norwich.
	Sir J. B. Lawes, Bt., and Sir J. H. Gilbert, Ph.D.	Rothamsted, Harpenden.
4. MIDLAND COUNTIES	Royal Agricultural College.	Cirencester.
	Major Fosbery	Warwick.
	T. H. Thursfield	Barrow, Broseley, Salop.
	E. E. Harcourt-Vernon	Grove Hall, East Retford.
5. ENGLAND, S.	C. Whitehead	Barming House, Maidstone.
	E. P. Squarey	The Moot, Downton, Wilts.
	M. J. Sutton	Kidmore Grange, Caversham.
6. SCOTLAND, W.	W. Calder	Castle Hill, Dalreoch, Dumbarton.
	Sir M. J. Stewart, Bt., M.P.	Ardwell, Stranraer.
	J. S. R. Ballingal	Eallabus House, Islay.
7. ENGLAND, N.W.	G. W. Wray	Leyburn, Yorkshire.

	Address.
-	Tortworth, Gloucestershire.
-	Long Ashton, Clifton, Bristol.
-	Butleigh Court, Glastonbury.
-	Moynalty, Co. Meath.
-	Currygrane, Edgeworthstown.
-	Lavistown, Kilkenny.
...L.	Ardfert Abbey, Tralee, Co. Kerry.

...he forecasts were sent to six ...thern districts of England on ...; but commenced and ended ...estern and Northern parts of ...

... of these forecasts, shown by ... ...pared solely from the reports ..., and is entirely independent ...ffice itself :—

... HARVEST FORECASTS, 1893.

	Per-centages.				
	Complete Success.	Partial Success.	Partial Failure.	Total Failure.	Total per-centage of Success.
... - -	61	32	7	—	93
...iemay -	58	37	4	1	95
... - -	68	22	10	—	90
... - -	90	7	3	—	97
... Warwick,	66	26	6	2	92
...Downton -	72	23	5	—	95
...arton -	59	31	8	2	90
... - -	57	27	13	3	84
...stonbury -	62	30	8	—	92
...wn -	49	38	8	5	87
... - -	68	25	11	2	87
... - -	64	27	8	1	91

...lts for the forecasts for 1893 ...ocess of 91, being the highest

...*ulture.*—As stated in previous ...mmunication with the Board of ...ing greater publicity during ...r forecasts prepared in the ...ginning of August a letter was ...g that the afternoon forecasts,

the same as those supplied for hay harvest purposes, should be sent to them daily for transmission to selected stations in Essex and Northumberland. This service was at once commenced and continued for two months. The following report has been received by the Council as to the results of this experiment:— Forecasts to Board of Agriculture.

Board of Agriculture,
4, Whitehall Place, London, S.W.,
April 21, 1894.

SIR,

I AM directed by the Board of Agriculture to transmit a memorandum on the subject of the experimental issue of weather forecasts in the course of last autumn.

I am, &c.
(Signed) RICHARD DAWSON,
Assistant Secretary.

Robert H. Scott, Esq., Secretary,
Meteorological Office,
63, Victoria Street, S.W.,

WEATHER FORECASTS during HARVEST, 1893.

The Board of Agriculture, with a view to test the value of the weather forecasts issued by the Meteorological Council, and the disposition of Agriculturists to make use of these warnings during harvest, arranged for an experimental transmission of the forecasts issued every afternoon during the months of August and September 1893. These were sent by telegraph to nearly two hundred selected telegraph offices in the rural districts of the counties of Essex and Northumberland.

The Post Office Authorities undertook to facilitate the despatch of these messages, the local postmaster being instructed to have them posted up in a conspicuous position in the window of the post office immediately on arrival. The time of receipt was about 4.30 p.m. daily, and such reports as have been received by the Board of Agriculture from the districts to which messages were sent, dispose them to believe that considerable reference in arranging their next day's work was made to the forecasts thus exhibited by farmers resident within short distances of the several offices, and by others who, by means of messengers, were in communication with the towns and villages.

Specific observations made daily at Morpeth in Northumberland were very favourable to the approximate accuracy of the forecasts, the direction of the wind being the item in which the warnings were occasionally in error. In the Allendale district of the same county a material saving of money by the economising of labour, by pre-arrangements made on reliance in the forecasts, was reported by one of the vice-presidents of the Newcastle Farmers Club.

The comparative steadiness of the weather conditions during the harvest months of last year, however, prevented a thorough test of the use of these weather warnings in furnishing reliable advice to agriculturists as to the meteorological conditions to be expected in the twenty-four hours covered by the forecasts, and the applicability of the system at different seasons and to more varied districts has yet to be determined.

Forecasts to Board of Agriculture.

With this view the Board of Agriculture have applied for the sanction of Her Majesty's Treasury to the repetition of the experiment in 1894 over a wider area and under weather conditions likely to be less uniform, selecting three eastern and three western counties, and varying the period for supplying the forecasts so as to cover the time of hay harvest in some cases, and that of grain harvest in others.

Storm Warnings.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix VIII., p. 57, are given the names of the stations furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade, issued in February 1874.

These stations were, at the end of March 1894, 175 in number, situated:—

85 in England, 16 in Wales, 47 in Scotland, 21 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

A comparison has been made in the Office between the warnings issued during the year and the weather experienced on our coasts, the warnings being tested by the method explained in Appendix VI., p. 55. The results of this comparison are shown in the following tables:—

RETURN of the RESULT of the COMPARISON between the WARNINGS ISSUED and the WEATHER EXPERIENCED in 1893.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 and 7.	Warnings not justified by subsequent Weather.	Warnings late. Force 9 reached at two Stations before issue.	Warnings partially late. Force 9 reached at one Station before issue.	Warnings issued unnecessarily owing to Telegraphic Errors.	Storms for which no Warning was issued.
Scotland, N.E. -	43	33	6	2	—	2	—	Feb. 14, March 15, Sept. 21.
„ E. -	29	12	12	5	—	—	—	Aug. 21.
„ N.W. -	42	27	10	2	1	2	—	March 15, Oct. 25, Dec. 8.
„ W. -	38	21	14	3	—	—	—	
Ireland, S.W. -	41	22	12	5	1	1	—	Aug. 21, Oct. 25.
„ N.W. -	43	26	13	2	1	1	—	March 15, Oct. 25, Dec. 20–21.
Irish Sea - -	37	36	1	—	—	—	—	Feb. 26, March 15, Aug. 21, Oct. 25, Dec. 20–21.
St. George's Channel	32	14	12	4	—	1	1	
Bristol Channel -	35	22	10	1	—	1	1	Dec. 20–21.
England, S.W. -	35	22	8	4	—	—	1	Dec. 20–21.
„ S. -	28	17	10	—	—	1	—	Feb. 26.
„ S.E. -	29	13	14	2	—	—	—	Feb. 26.
„ E. -	25	14	8	3	—	—	—	
„ N.E. -	23	13	7	1	—	2	—	Oct. 25, Dec. 15–16.
Totals - -	480	292	137	34	3	11	3	
Per-centages -		60·8	28·6	7·1	0·6	2·3	0·6	

NOTES as to GALES EXPERIENCED but for which no WARNING was issued. Storm Warnings.

February 14*th*.—A strong South-Easterly gale over the N.E. of Scotland. Our W. and N.W. coasts had been warned, but on the night of February 13th–14th a new depression—both larger and deeper than the one which preceded it—advanced more rapidly than was anticipated, and unexpectedly caused South-Easterly gales in Scotland. On the morning of the 14th it was too late to remedy the defect.

February 26*th*.—A Southerly gale over the S. and E. of England, and a North-Westerly gale in the Irish Sea.

Force 8 was *exceeded* at a few stations only; the wind blowing as a gale in zones or bands. The appearance of the map for 6 p.m. on 25th was not at all threatening—the wind was, in fact, then decreasing in force.

March 15*th*.—A Westerly gale over Scotland, the N.W. of Ireland, and the Irish Sea.

The 6 p.m. chart of March 14th showed a depression advancing towards Norway from the Westward, which did not appear dangerous, but its intensity increased later. At 8 a.m. on 15th it was altogether too late to do anything.

August 21*st*.—A South-Westerly gale in Ireland and some parts of Scotland. There was evidently a depression approaching Ireland at 6 p.m. on 20th, but the Irish reports were so faulty that we could make nothing of them. The actual changes were also very complex.

October 25*th*.—A Westerly gale over the Irish Sea and N.E. of England. A large, but not deep, depression lay over the northern parts of our area on the 24th, and was moving eastwards. A "V" shaped depression subsequently appeared in the west. It is remarkable that the observations we received by wire showed no general gale nor anything of a really stormy character in the conditions.

December 8*th*, Scotland N.W.—A South-Westerly gale.

There is no indication in the map for 6 p.m., 7th, that the depression which caused this gale (over one district only) was approaching.

December 20*th*–21*st*.—A South-Westerly gale over the N. of Ireland, Irish Sea, and Bristol Channel.

This was caused by a deep secondary depression, of which the reports for the 19th gave no indication.

On September 21*st and December* 15*th to* 16*th*.—Gales were felt on our N.E. coasts. In these cases warnings had been duly sent to adjacent coasts, but the gale spread further than was anticipated.

The following table contains a comparative statement of the storm warnings and their results in 1893, and in the nine preceding years. It will be seen that the total per-centage of warnings justified was nearly the same as in 1892. Comparison of results for 1893 with previous years.

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
		p.c.	p.c.	p.c.	p.c.
1884	461	66·4	20·0	86·4	12·1
1885	591	55·3	24·0	79·3	19·5
1886	542	55·3	26·9	82·2	15·9
1887	472	55·5	26·1	81·6	16·4
1888	539	55·3	28·6	83·9	14·3
1889	373	47·7	33·5	81·2	16·9
1890	525	61·0	25·5	86·5	9·3
1891	522	62·3	24·5	86·8	7·5
1892	488	59·4	31·2	90·6	6·8
1893	480	60·8	28·6	89·4	7·1

Fishery Barometers.

Fishery Barometers.—To add to the means available to the sea-going population for obtaining warnings of stormy weather barometers have for many years been supplied by the Office on loan to fishing villages and other places on the coast, to be set up for public information. The whole number of stations provided by the Office with these instruments is 198. Of these 63 are in England, 7 in Wales, 57 in Ireland, 66 in Scotland, 4 in the Isle of Man, and 1 in Jersey. The list is given in Appendix IX., p. 60.

PART III.

Land Meteorology of the British Isles.

Observatories and Stations.—The observations of the climate of the British Isles, which are received by the Office from certain stations, may be arranged in five classes, according to the degree of completeness with which they are made.

Self-recording observatories.

1. Seven Observatories, furnished with self-registering instruments by which all the principal meteorological phenomena are recorded continuously. These alone afford the materials necessary for the study of the periodic variations of the meteorological elements.

Anemographic stations.

2. Nine Anemographic stations furnished with instruments registering the wind only. The records from these stations relate rather to weather as distinguished from climate, and are especially important in connexion with storms. They are often useful in affording evidence available in courts of law with respect to collisions at sea, and to damage done by wind.

Stations of Second Order.

3. Seventy-four stations of the Second Order, furnishing climatological information from eye observations taken twice a day. The observers at these stations are all volunteers.

Telegraphic Reporting Stations.

4. Thirty-two Telegraphic Reporting Stations, at which the observations are taken by eye, but supplemented in some cases by self-recording aneroids, &c., and supply the material upon which the daily weather reports and forecasts are based. The hours of observation at these stations are determined by the requirements of the telegraphic system, as explained in Part II., but the data which they furnish are also utilized to afford climatological information for parts of the country where Stations of the Second Order do not exist.

5. Extra stations furnishing returns with less completeness and detail than those of Class 3. Extra stations.

A continuous record of the amount of bright sunshine is received from 46 stations in the British Isles, of which some are First or Second Order stations, whilst from others the sunshine record alone is received. A return of the daily duration of sunshine is also received. See Appendix XI. (p. 64). Sunshine stations.

A fuller account of the methods employed by the Office in dealing with these records will be found in Appendix X. (p. 63).

Appendix XI. (p. 64) contains a list of the stations furnishing information relating to the land meteorology of the British Isles during the year. Documents received.

Inspection of the Stations.—The self-recording observatories and the anemographic stations (Classes 1 and 2), as well as the Telegraphic Reporting Stations (Class 4), are regularly visited each year by the Inspectors of the Office. The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 3), some belong to the Royal Meteorological Society, and these are visited by an Inspector appointed by that Society, an allowance being made by the Office toward the cost of the inspection, in accordance with the recommendation of the Treasury Committee (1877). The remaining Stations of the Second Order, including those belonging to the Scottish Meteorological Society, are visited, most of them annually, by the Inspectors of the Office. The inspection of the self-recording observatories was carried on by Mr. T. W. Baker and Mr. E. G. Constable from the Kew Observatory. Inspection of stations.

Extracts from the reports of the Inspectors are given in Appendix V. p. 33.

Information supplied to the General Register Office, Dublin.—Reports from the Irish stations of the Office have been regularly supplied to the Registrar General for Ireland, for his Weekly and Quarterly Returns. Reports supplied to Registrar General for Ireland.

The Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office (see Appendix VI., p. 52), supplies, by its synchronous charts and Monthly Summaries, a very complete and instructive view of the chief meteorological changes, day by day, over the greater part of Europe, such as is not believed to be found in the similar publications issued by any other office. Publications.

Appendix I. to the Weekly Weather Report for 1893 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature for each district, for the 28 years 1866–1893, and also the Monthly and Progressive values of Accumulated Heat, Rainfall, and Bright Sunshine for all the districts in each month of 1893. Appendix II. to the same Report gives the Weekly and Progressive values for the same elements during the year 1893 (in continuation of Appendix II. for the year 1892).

Hourly Readings of Meteorological Instruments—The Volume of Hourly Means for 1891 is ready for press, and that for 1892 has been commenced. Hourly Readings of Meteorological Observations.

The volume for 1891 contains, in addition to what has appeared in previous volumes, results for Fort William Observatory, and also hourly records of sunshine for all the observatories.

There is further a special appendix giving the results of ten years hourly tabulation of the sunshine recorded in the ten years 1881–90, at the seven observatories, as announced in last Report.

Stations for publication.

Observations at Stations of the Second Order.—The volume for 1890 is now issued.

As regards the detailed publication on Form A., the list of stations is the same as that for 1889 with the exception of the Orkney Station, which was removed in 1890 from Swanbister to Stenness, 4 miles to the N.W. With regard to the B. Stations (monthly means and summaries) the list has been increased by three, viz.,

Edinburgh—R. Mossman, F.R.S.E., F.R. Met. Soc.
Ladylaw (Hawick)—W. R. Wilson, Esq.
Parkstone (near Bournemouth)—R. Hawkesworth Barnes, B.A., F.R. Met. Soc.

And reduced by one, Cramlington.

Miscellaneous.

Anemometer Experiments.

Anemometer Experiments.—Experiments have been in progress during the year with the Dines' pressure-tube anemometer, erected on the roof of the Office in Victoria Street to test its indications. The result of these experiments are more fully dealt with in Note A., p. 20, but the Council are about to erect a second instrument by the side of the first in order to make some comparative experiments during the coming winter, with a view to testing the effect of varying the length of the tube, contracting its bore, and possibly some other points which it is considered desirable to further elucidate, before arriving at a definite opinion concerning the merits of this instrument and the best form to give to it.

Sunshine Values.

Sunshine of the British Isles.—The tabulation of the hourly values of sunshine for the seven observatories from the year 1881 has been completed, and the mean values for the years 1881–90 will, as mentioned above, be published in the volume of "Hourly Means" for 1891.

Hourly Mean Values.

Hourly Mean Values of Pressure and Temperature.—The calculations of the mean hourly values of these elements for the seven observatories for the 15 years 1869–1893, and for four of the observatories for the further period of three years 1884–1886, has been completed, and are now ready for discussion preparatory to publication.

Rain Tables for the British Isles.

Rainfall Means for the British Islands.—Considerable progress has been made with this work during the year. The stations for which the monthly and annual values are to be published have been very carefully selected—so that the general distribution of rainfall over our Islands—for the 10 years 1881–90—is well represented, and for a large number of the stations values for the decade 1871–80, or for the lustrum 1876–80, will also be published.

The total number of stations for which the values for 1881–90 will be furnished is, approximately, as follows:—

England and Wales - - -	250
Scotland - - - - -	140
Ireland - - - - -	36

The greater part of the values have already been received, many of them are in type, and the checking and arrangement of the remainder are being proceeded with as quickly as possible.

Library.

Library.

The library contains standard works on Meteorology and the allied Sciences, and is, besides, particularly rich in Transactions, Proceedings, Reports, and other Publications which give a large mass of Meteorological observational data from all parts of the world, extending over many years. It consists at present of about 12,500 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men for reference at the Office.

Appendix XII., p. 69, contains a list of the additions to the library during the year, which have been catalogued upon cards, and are entered in the reference catalogues under (1) Authors, and (2) Subjects.

Expenditure.

Financial.

Appendix XIII., p. 93, shows the total receipts and payments of the Council during the year ending 31st March 1894. The amount voted by Parliament was 15,300*l.*, as in the previous year, in addition to which extra receipts from various sources amounting to 836*l.* 14*s.* 10*d.* also became available.

The following abstract of expenditure shows the amount properly chargeable against the Parliamentary grant of the year in question, and its distribution under the various heads, together with the increase or decrease in 1893–94 as compared with the previous year:

Net Expenditure.	1892-93.	1893-94.	Increase.	Decrease.
General Administration:	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Payment of Council -	993 15 0	991 5 0	—	2 10 0
Secretary - -	800 0 0	800 0 0	—	—
Office - - -	793 0 0	903 18 8	110 18 8	—
Rent, fuel, and lighting -	720 18 2	703 7 1	—	17 11 1
Alterations to premises, attendance, and contingencies - -	476 10 1	387 13 1	—	88 17 0
Expenses incidental to International Meteorological Congress -	2 8 0	—	—	2 8 0
Pensions - -	186 16 4	186 16 4	—	—
Special Researches -	882 13 2	1,052 9 5	169 16 3	—
Land Meteorology -	3,671 8 0	3,657 2 3	—	14 5 9
Weather Information -	3,847 8 6	3,804 6 4	—	43 2 2
Inspections - -	487 7 1	589 6 7	101 19 6	—
Ocean Meteorology -	2,360 6 0	2,893 2 9	532 16 9	—
Total - - £	15,222 10 4	15,969 7 6	915 11 2	168 14 0

In the year 1893–94 the sum of 1,475*l.* 3*s.* 10*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, and rental of private wires.

(Signed) R. Strachey,
Chairman.

NOTE A.

Report on the Performance of the Pressure-Tube Anemometer on the Roof of the Meteorological Office; by Mr. R. H. Curtis.

During the past 13 months experiments have been carried on at the Meteorological Office with one of the Dines' pressure-tube anemometers described in the report for last year.

The vane of the instrument is placed upon an iron post, erected upon the roof of the Office, at a height of 24 feet above it and 93 feet above the ground; the recording portion being placed in a room on the third floor of the building and connected with the vane by about 70 feet of metal tube.

Apart from the eddies caused by the building on which the anemometer is erected, and which, there is reason to think, are not entirely surmounted at the height at which the vane is placed, the force of the wind is more or less interfered with in different directions by groups of buildings surrounding the Office. From about S.E. through south to S.W., and also from about N.W. to north, the exposure is best, the buildings in those directions being comparatively low or else well removed from the Office. But from north to S.E. the vane is dominated by high buildings close at hand, whilst from about S.W. to N.W., the wind-force is broken by other high buildings, distant only about 50 to 70 yards. The site is, therefore, by no means an ideal one for anemometrical experiments, although perhaps, taking all things into consideration, it fairly represents the conditions which might be looked for in the centre of any large town.

As soon as the instrument was got into operation it was found that modifications were needed in various directions; and, indeed, the chief result which has been obtained thus far has been to suggest improvements in details, the necessity for which could only be ascertained by actual experience, obtained under the conditions in which the instrument was designed to act. None of these alterations affect, in any way, the principle of the instrument, but they have facilitated its adjustment in various directions, and especially have they improved the trace yielded by the recording portion. This has been done by introducing a fine pen which gives a line at once delicate and distinct, and free from any danger of becoming merged in those immediately adjoining it. The importance of this will be understood when it is remembered that every individual gust of wind is recorded by this instrument.

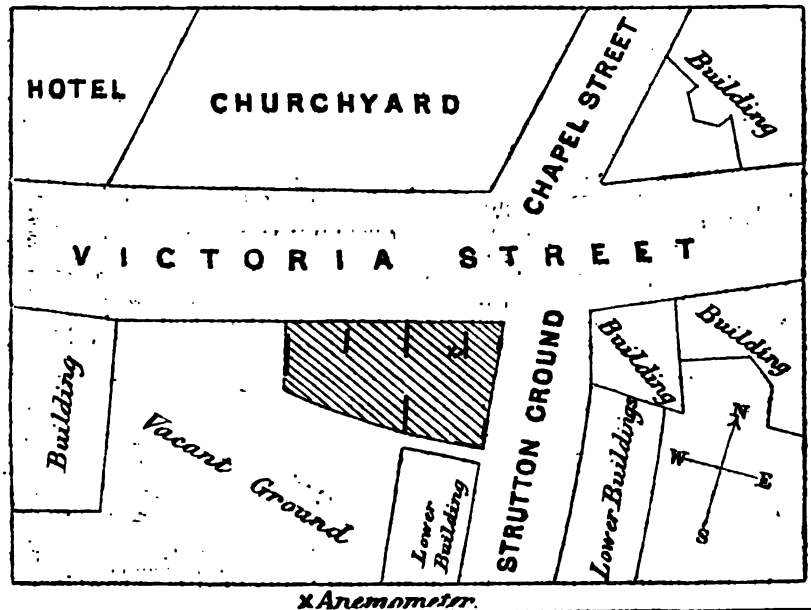
The carrying out of these alterations and improvements, as they suggested themselves, has necessitated dismounting portions of the instrument on several occasions, involving a loss of record extending on the whole over many weeks.

In order to obtain a general idea of the working of the instrument a comparison has been made between the mean hourly velocities obtained from its record at Westminster, and those recorded by the Robinson cup anemometer at the Kew Observatory.

For this purpose it was first necessary to reduce the latter to the equivalent values which would have been obtained had the factor 2·2 been used instead of 3, for the relation between the movement of the cups and of the wind. This was necessary, since the scale of the pressure-tube anemometer is based on the results obtained by Mr. Dines from the experiments made by him with a whirling apparatus, and which led him to conclude that 2·2 was the proper factor for a Robinson cup anemometer of the size and pattern used at Kew. The mean velocities were obtained from the pressure-tube records by estimation.

Of course, the agreement which was looked for between the two records was only of a very general character, considering that the instruments are eight miles apart, in a straight line, and that much of the intervening space is covered with houses. As a matter of fact, it proved to be much closer than was anticipated.

The observations were all grouped under eight points for direction, and the mean velocity was obtained for each point; a reference to the accompanying plan of the Office and its immediate vicinity will fully explain the results obtained and which are shown in the following table:—



x Anemometer.

Direction of Wind - -	N.		N.E.		E.		S.E.	
	K.	M.O.	K.	M.O.	K.	M.O.	K.	M.O.
Average Velocity -	9·5	9.8	8·5	6·2	8·3	6·1	5·6	6·4
Per centage M.O. ± K.	103		73		73		114	
No. of Observations -	(263)		(184)		(223)		(121)	

Direction of Wind - -	S.		S.W.		W.		N.W.	
	K.	M.O.	K.	M.O.	K.	M.O.	K.	M.O.
Average Velocity -	11·7	11·7	11·5	10·2	8·0	6·8	7·0	6·5
Per centage M.O. ± K.	100		89		85		93	
No. of Observations -	(*267*)		(*1115*)		(*628*)		(*306*)	

Mean of Means (velocity), Kew *8·8* miles per hour. M.O. *8·0* miles per hour.
Total No. of Observations used *3107*.

The slightly higher mean velocity shown by the Meteorological Office instrument with northerly winds is probably due to the fact that the large block of lofty buildings, bearing slightly to the east of north from the Office, deflects the wind when blowing from a little to the west of north along the line of Chapel Street upon the Office, and thus gives it rather more than its due share. On the north-east and east, as already stated, the Office is greatly sheltered by houses from 30 to 40 feet higher, at a very short distance off, and this sufficiently accounts for the low per centages shown by the Office instrument when the wind blows from those points. To the south eastward, and thence round to nearly south-west, the aspect is fairly open, and the buildings adjoining the Office are all comparatively low, and under these points, therefore, the Office per centage rises; the excess over Kew shown under south-east, is most probably due to the fact that while the Office is open in that direction the Kew Observatory is not so, but is considerably sheltered by the town of Richmond, and by the high land which rises steeply up to the park behind it. To the south-west the high building shown in the plan again begins to affect the Office instrument, and the per centage falls still lower with the west winds, in which direction the yet higher hotel buildings stand. To the north-west, however, the buildings are less lofty and are also more remote, and, consequently, the per centage of the velocity at the Office again rises to within 7 per cent. of that yielded by the Kew instrument.

Upon the whole, the comparison is a striking one, and, if it be accepted, it speaks strongly in favour both of the trustworthiness of the pressure-tube instrument and, also, of the mean record yielded by the Robinson cup instrument.

During the ensuing year it is proposed to make some comparative experiments with two pressure-tube instruments, erected under precisely similar conditions as to exposure, but varying the lengths of the tubes connecting the float with the vane, and also the bore of the tubes at certain places. The precise details of the experiments have not, however, as yet been settled.

APPENDIX.

APPENDIX I.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1894. The figures opposite to each show the total number of such Logs which they have returned to the Office during the period that they have been observing.

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Alford, F. - - -	1	S S. "Monarch."
Andersen, O. E. - -	10	S.S. "Longhirst."
Angus, T. S. - - -	8	S.S. "Ballaarat."
Armstrong, B. G. - -	4	S.S. "Pará."
Atkinson, G. W. - -	8	S.S. "Ganges."
—— S. P. H. - - -	7	"Osborne."
Bett, Dr. W., R.N. - -	8	H.M.S. "Stork."
Blackburne, H. S. - -	12	S.S. "Bombay."
Bolton, S. H. - - -	16	S.S. "El Dorado."
Bourke, Capt. E. G., R.N. -	9	H.M.S. "Ringarooma."
Bright, H. - - -	8	Barque "Beltana."
Buchan, J. - - -	23	S.S. "Deramore."
Cameron, J. G., R.N.R. -	10	S.S. "Germanic."
Campbell, J. - - -	9	"Balmoral."
—— J. J. W. (Surgeon) -	1	S.S. "Diana."
Chesshire, G. H. - -	2	S.S. "Aldgate."
Crowley, C. - - -	7	"Verajean."
Cust, Lieut. and Comr. H.E.P., R.N.	1	H.M.S. "Dart."
Dart, L. C. - - -	14	Barque "Alcides."
Davidson, D. C. - -	1	"Loch Rannoch."
—— R. - - -	1	S.S. "Diana."
Davis, G. W. - - -	1	S.S. "Alberta."
De Horne, M. - -	4	S.S. "Carthage."
Docherty, H. - - -	5	Barque "Tinto Hill."
Elliott, Mr. C. - -	2	S.S. "Wilcannia."
England, T. - - -	14	Barque "Glen Grant."
Exham, T. K., F.R.A.S. -	15	S.S. "Tamar."
Field, Comr. A. M., R.N. -	12	H.M.S. "Egeria."
Fraser, C. - - -	1	S.S. "Massilia."
—— W. D. - - -	7	"Corolla."
Hepworth, M.C.W. -	11	S.S. "Port Denison" and S.S. "Port Victor."
Jamieson, D. E. - -	2	S.S. "Port Adelaide."
Kemp, A. H. - - -	6	Barque "Hudson."

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Lehman, C. - -	4	"Loch Sloy."
Lewes, Lieut. P. V., R.N. -	1	H.M.S. "Blanche."
Lindley, G. R., R.N. - -	1	H.M.S. "Blanche."
McKinstry, E. R., R.N.R. -	1	S.S. "Germanic."
Marescaux, Lieut. A. E. H., R.N.	1	H.M.S. "Dart."
Margesson, Lieut. W. H. D., R.N.	2	H.M.S. "Egeria."
Martin, Walter, R.N.R. -	6	S.S. "German."
Millican, J. W. - -	8	S.S. "Loughrigg Holme"
Milne, W. F. - - -	10	S.S. "Eclipse."
Milner, W. H. - - -	17	S.S. "Trent."
Mitchell, George - -	5	S.S. "California."
—— J. - - -	3	Barque "Cape York."
Moignard, P. - - -	7	"Garsdale."
Molony, E. J. - - -	11	"British Merchant."
Murdoch, Peter - -	14	"Sierra Lucena."
Murray, A., junr. - -	2	Barque "Perseverance."
—— R. G., R.N.R. - -	1	S.S. "Britannia."
Nicol, R. - - -	2	S.S. "Germanic."
Parry, M. - - -	16	S.S. "Prydain."
Parson, G. F. - - -	12	"Earnock."
Pentin, W. - - -	2	S.S. "Wilcannia."
Philip, W., junr. - -	1	"Salamis."
Pope, J. - - -	9	S.S. "Essequibo."
Price, J. H. - -	7	"Othello."
Randall, W. - - -	14	"Laomene."
Robertson, T. - - -	1	S.S. "Active."
Rosseter, W. L. - -	16	"Brenda."
Sargent, A. H. - -	7	"Pleione."
Scott, G. P. - - -	10	"Crompton."
Simpson, Alexander - -	16	S.S. "Thermopylæ."
—— Alexander - -	23	S.S. "Traveller."
Smith, J. - - -	2	S.S. "Dunera."
Smyth, Comr. M. H., R.N. -	3	H.M.S. "Stork."
Spalding, T. F. - -	5	S.S. "Australasian."
Streater, R. - - -	4	"Euterpe."
Thompson, J. E. (the late) -	6	S.S. "Monarch."
Trott, S., F.R.Met.Soc. -	25	S.S. "Minia."
Tyson, J. - - -	2	S.S. "Arab."
Walker, H., R.N.R. - -	18	S.S. "Aurania" and S.S. "Etruria."
Warden, W. - - -	6	S.S. "Pembroke Castle."
White, W. E., R.N.R. -	9	S.S. "Ormuz."
Wilson, J., R.N.R. - -	10	S.S. "Circassia."

Cape Juby (N.W. Africa) -	W. B. Silverwood and F. S. Zaytoun.	11	Two observations daily, 1893, March to December; 1894, January.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper -	2	Lighthouse Register, 1893, January to December.
Cape Spartel (Tangier) - -	E. C. Hathaway, Lloyd's Signalman.	5	Two observations daily, 1893, May to December; 1894, January, February.
Cay Lobos (Bahamas) - -	Byron N. Jones, Lightkeeper	3	Lighthouse Register, 1892, July to December; 1893, January to December.
Cay Sal (Bahamas) - -	T. R. Thompson, Sen., Lightkeeper.	2	„ „ 1892, „ „ „ June.
Famagusta (Cyprus) - -	G. Eliades - - -	4	Two observations daily, 1893, February to May.
Futuna (New Hebrides) - -	Rev. W. Gunn, L.R.C.P. -	3	Notes of Cyclones on 28th, 29th January 1889, 15th January 1893, and 20th and 21st February 1893.
„ „ - -	„ „ -	2	Three observations daily, 1888, August, October to December; 1889, January.
„ „ - -	„ „ -	4	Two observations daily, 1892, October to December; 1893, January to July.
George Town (British Guiana) -	Robert Ward - -	5	„ „ „ 1893, January to December.
Gibraltar - - - -	Staff-Sergeant R. Scott, Med. Staff Corps.	11	„ „ „ 1893, March to December; 1894, January, February.

List of Documents—*continued.*

Place.	Observer.	No. of Documents.	Nature of Observations.
Inagua (Bahamas)	J. W. Roberts, Lightkeeper	2	Lighthouse Register, 1893, January to December.
Kaneohe (Oahu)	H. Cobb-Adams	3	Two observations daily, 1893, January to June, September to November.
Kyrenia (Cyprus)	M. Fuleiham and P. Michaelides.	4	„ „ „ 1893, February to May.
Lagos	Wm. A. Cole	12	„ „ „ 1893, February to December; 1894, January.
Larnaca (Cyprus)	C. Perini	4	„ „ „ 1893, „ May.
Limassol (Cyprus)	Luigi Béraud	4	„ „ „ „ „ „
Mojanga (Madagascar)	Stratton C. Knott, Vice-Consul.	11	„ „ „ „ „ December.
Malden Island	- - - -	1	Three „ „ 1892, May to December; 1893, January, February.
Nicosia (Cyprus)	G. Stephen	4	Two „ „ 1893, February to May.
Papho (Cyprus)	E. A. Malliotis	4	„ „ „ „ „ „
Point King (King George's Sound).	S. Mitchell	2	Lighthouse Register, 1892, November to December; 1893, January to November.
Principe Island (West Africa)	G. R. Scovell	6	Two observations daily, 1893, February to December; 1894, January.
St. Helena	H. S. Hands	10	One observation daily, 1893, February to December.
„	„	7	Continuous record of wind (direction and velocity), 1893, February, April, May, July to September; 1894, January.
Sultan Tchair (Asia Minor)	C. Z. Bunning	3	Two observations daily, 1893, December; 1894, January, February.
Suva (Fiji)	J. D. W. Vaughan, F.R.Met. Soc., F.R.G.S.	8	One observation daily, 1893, January to October.
Teneriffe (Sitio de Cullen)	A. F. Perry	11	Two observations „ 1893, March to December; 1894, January, February.
Tobago	J. P. Tulloch, M.A., M.D.	2	„ „ „ 1893, February to June.
Tonga (New Hebrides)	A. Cronstedt	2	„ „ „ 1893, October to December.
Trinidad	J. H. Hart, Supt. Botanic Gardens.	6	„ „ „ 1892, July to December; 1893, January to November.
Watling Island (Bahamas)	T. R. Thompson, jun., Lightkeeper.	1	Lighthouse Register, 1893, January to June.

List of Documents received from Ships.

	Captain's Name.	Ship.	Voyage.	Year.
1	Adamson, A. W.	S.S. Victoria	Sydney, viâ Suez	1893
2	" "	"	Australia, viâ Suez	1893-94
	Alford, F.	S.S. Monarch	Off coasts of British Isles	1893
	Andersen, O. E.	S.S. Longhirst	New York and Continental Ports	1893
	" "	"	Quebec, Continental Ports, &c.	1893-94
3	Angus, T. S.	S.S. Ballaarat	Australia, viâ Suez	1893
4	" "	"	" "	1893
4	" "	"	Bombay	1893-94
5	Armstrong, B. G.	S.S. Pará	West Indies	1893
6	" "	"	"	1893
	Asquith, W.	S.S. Deucalion	Batavia	1891-92
7	Atkinson, G. W.	S.S. Ganges	Calcutta, viâ Suez	1893
	" "	"	" "	1893
8	" "	"	China, viâ Suez	1893-94
	" S. P. H.	Osborne	Calcutta	1892-93
9	Barker, D. W., R.N.R.	Training ship Worcester	Off Greenhithe	1893
	Barr, J.	S.S. Orestes	Batavia, viâ Suez	1891
	Bartlett, T.	S.S. Laertes	China, viâ Suez	1891
	Barwise, J.	S.S. Sarpedon	China, viâ Suez, and Java, viâ Suez	1890-91
	Batt, H. E.	S.S. Hector	" " " "	1890-91
	Beeching, C.	Barque Ellesmere	San Francisco	1893-94
10	Blackburne, H. S.	S.S. Bombay	Bombay, viâ Suez	1893
11	" "	S.S. Brindisi	" "	1893
12	" "	S.S. Malwa	Bombay and Shanghai, viâ Suez	1893
	Bolton, S. H.	S.S. El Dorado	Continental Ports	1893
	Bourke, E. G., R.N.	H.M.S. Ringarooma	New Zealand	1892-93
	Bright, H.	Barque Beltana	Adelaide	1893-94
	Brown, R. J.	S.S. Titan	China, viâ Suez	1891
13	Buchan, James	S.S. Deramore	New York, Algoa Bay, Rangoon, and Suez	1893
14	Cameron, J. G., R.N.R.	R.M.S. Germanic	New York	1892
15	" "	R.M.S. Teutonic	"	1893
	Campbell, James	Balmoral	Calcutta	1892-93
16	Chesshire, G. H.	S.S. Aldgate	Bombay, viâ Suez	1893
16	" "	"	Karachi	1893
17	" "	"	Bombay, viâ Suez	1893-94
18	Clunie, James	S.S. Transvaal	Cape Town, Bombay, viâ Suez, and Calcutta	1893
	Crowley, C.	Verajean	Lyttleton	1892-93
19	Crutchley, W. C., R.N.R.	S.S. Kaikoura	New Zealand, viâ Cape Town, and Rio Janeiro	1893
20	Cust, Lieut. and Comr. H. E. P., R.N.	H.M.S. Dart	New Hebrides and New Caledonia	1892
	Dart, L. C.	Barque Alcides	San Francisco	1892-93
	Davidson, D. C.	Loch Ranuoch	Melbourne	1892-93
21	" James	Barque Polar Star	Antarctic Seas	1892-93
22	" Robert	S.S. Diana	"	1892-93
	Davies, Llewellin	Barque Lady Wolseley	Iquique	1892-93
	Davis, G. W.	S.S. Alberta	Bombay, viâ Suez	1893
23	De Horne, Morris	S.S. Carthage	China, viâ Suez	1893
24	" "	"	Bombay, viâ Suez	1893
	Dermody, W. J.	Highland Forest	Calcutta, Lyttleton (N. Z.)	1892-93
	Dickens, E. G.	S.S. Diomed	China and Japan, viâ Suez	1891
	" "	S.S. Stentor	Liverpool and Glasgow	1891
25	Dickinson, L. R.	S.S. Medway	Barbados	1892-93
26	" "	"	"	1893-94
	Docherty, Hugh	Barque Tinto Hill	Chittagong	1893-94
27	Dulling, George	S.S. Port Pirie	Australia viâ Cape of Good Hope	1893
	Elder, William	S.S. Nestor	China and Japan, viâ Suez	1890
	England, Thomas	Barque Glen Grant	Apalachicola	1892-93

	Captain's Name.	Ship.	Voyage.	Year.
	England, Thomas	Barque Glen Grant	Apalachicola	1892–93
	Evans, J. C.	Barque Peri	Brisbane and New Zealand	1892–93
2	Exham, T. K.	R.M.S. Tamar	East Coast of South America	1892–93
2	„ „	„ „	„ „ „	1893
28	Fairweather, Alexander.	S.S. Balaena	Antarctic Seas	1892–93
29	Field, Comr. A. M., R.N.	H.M.S. Egeria	Hong Kong and Macclesfield Bank	1893
29	„ „	„	Borneo	1893
	Fordyce, W	County of Roxburgh	Mauritius and Calcutta	1893–94
30	Fraser, C.	S.S. Massilia	Bombay, viâ Suez	1893
30	„	„	Australia, viâ Suez	1893–94
31	„ Duncan	S.S. Bellenden	East Coast of South America	1893
	„ W. D.	Corolla	West Coast of South America	1892–93
	Goldsmith, O. S.	Barque Ariel	Brisbane and Callao	1892–93
	Gregory, T. M.	S.S. Menelaus	Java, viâ Suez	1891
	Hannah, W. T.	S.S. Glaucus	China, viâ Suez, and Java, viâ Suez	1891
	Hannay, C. E.	Simla	Towards San Francisco	1892
32	Henderson, F. F., R.N.	R.Y.S. Valhalla	Madeira and Mediterranean Ports	1893
2	Hepworth, M. C. W.	S.S. Port Denison	Sydney, viâ Cape, and home, viâ Suez.	1892–93
33	„ M. C. W.	S.S. Port Victor	Adelaide, viâ Cape, and home, viâ Suez.	1893–94
	Hutchinson, J. P.	S.S. Stentor	Java, viâ Suez	1891
	Ismay, A. J.	Barossa	Adelaide	1892–93
	Jackson, C.	S.S. Palamed	China, viâ Suez	1891
	„ M. H. F.	S.S. Telamon	„	1891
	„ T. S.	S.S. Palinurus	„	1891
	Jamieson, D. E.	S.S. Port Adelaide	New York, China, Japan, viâ Suez	1892–93
34	„ „	S.S. Port Pirie	Australia, viâ Cape, and home, viâ Suez.	1893–94
	Jones, Henry	S.S. Telemachus	China and Japan, viâ Suez	1891–92
35	„ J. H.	Andora	Wilmington (Cal.), San Pedro, and Tacoma (U.S.A.).	1892–93
	„ P. H.	City of York	Callao and Astoria	1893–94
	Kemp, A. H.	Barque, Hudson	Otago	1892–93
	Lapage, W. P.	S.S. Anchises	East Indies	1891–92
	Lawrison, G. M.	Eaton Hall	San Francisco	1892–93
	Lehman, Charles	Loch Sloy	Melbourne	1892–93
36	Lindley, G. R., R.N.	H.M.S. Blanche	Aden, India, and Zanzibar	1891
	McGregor, James	S.S. Glenartney	China and Japan, viâ Suez	1893
	„ „	„ „	„ „	1893–94
14	McKinstry, E. R., R.N.R.	R.M.S. Germanic	New York	1893
37	Marshall, W. H.	Barque Elvira	Fernandina (Florida) and Rosario	1892–93
	Martin, T. C.	Loch Tay	Melbourne	1893–94
38	„ W., R.N.R.	S.S. German	Mauritius, viâ Cape Town	1892–93
38	„ „ „	„ „	Cape Town	1893
9	Miller, A. T., R.N.	School Ship Conway	Off Birkenhead	1893
2	Millican, J. W.	S.S. Loughrigg Holme	Galveston, Hamburg, New York, and Montreal.	1893
	Milne, W. F.	S.S. Eclipse	Davis Straits	1893
	Milner, W. H.	R.M.S. Trent	East Coast of South America	1892–93
39	„ „	„ „	„ „	1893
40	„ „	„ „	„ „	1893–94
	Mitchell, George	S.S. California	Venice, New York, and New Orleans.	1892–93
	„ „	„ „	New Orleans, Mediterranean Ports, and New York.	1893
	„ John	Barque Cape York	Newcastle (N.S.W.), San Francisco, and Dunkirk.	1892–94
	Molgnard, Philip	Garsdale	California, Tacoma (U.S.A.)	1892–93
	Molony, E. J.	British Merchant	Melbourne, Newcastle (N.S.W.), Colombo, and Wallaroo.	1892

Captain's Name.	Ship.	Voyage.	Year.
[41] Morton, D.	S.S. Silvertown	West Coast of South America	1893
[42] Moseley, F. J.	S.S. Anglian	Cape Town, Zanzibar, &c.	1893–94
Murdoch, Peter	Sierra Lucena	Chittagong and Akyab	1892–93
Murray, Alexander, junr.	Barque Perseverance	Hudson's Bay and Repulse Bay	1892–93
[43] Murray, R. G., R.N.R.	S.S. Britannia	Australia, viâ Suez	1892–93
Nelson, R.	S.S. Myrmidon	China, viâ Suez	1891–92
Nicholson, J. I.	Majestic	Calcutta	1892–93
Nicol, Robert	R.M.S. Germanic	New York	1892–93
" "	" "	" "	1893
[2] Niles, W. H.	Ben Cruachan	Buenos Aires and Chile	1892–93
Nish, H.	S.S. Cyclops	East Indies	1891
Parry, Moses	S.S. Prydain	Mediterranean Ports and New York.	1892–93
Parson, G. F.	Earnock	New York, Shanghai, and Boston	1892–93
[44] Patterson, J. A.	Barque Dunstaffnage	Calcutta	1893
" William	Barque Lindfield	Melbourne	1893
Pattman, R.	Barque Loch Torridon	"	1892–93
" "	" "	"	1893–94
[45] Payne, C. J.	S.S. Elton	Norfolk (U.S.A.), and Bombay, viâ Suez.	1893–94
[46] Pentin, Walter	S.S. Wilcannia	Adelaide, viâ Cape of Good Hope, and home, viâ Suez.	1893
[46] " "	" "	" " "	1893
Philip, William, junr.	Salamis	Melbourne	1893–94
[47] Pope, J.	S.S. Essequibo	West Indies	1893
Price, J. H.	Othello	Melbourne	1892–93
Pulford, I.	S.S. Patroclus	China, viâ Suez	1891
Purdy, Thomas	S.S. Dardanus	" "	1891
Randall, W.	Laomene	New York, Batavia, and Calcutta	1892–93
Rawlings, E. S.	S.S. Ajax	China, viâ Suez	1891
Richards, Comr. G. E., R.N.	H.M.S. Triton	Off East coast of England	1893
[48] Rigaud, H. C.	R.M.S. Magdalena	River Plate, Lisbon, and Brazils	1892–93
Riley, J.	S.S. Teucer	China, viâ Suez	1890–91
[49] Robertson, Lieut. and Comr. C. H., R.N.	H.M.S. Herald	Shiré and Zambesi Rivers	1892
[50] Robertson, " "	" "	" " "	1893
" Thomas	S.S. Active	Antarctic Seas	1892–93
Rohde, H.	Barque Archdale	Port Townsend, Australia, San Diego (Cal.), and Tacoma.	1892–93
Rosseter, W. L.	Brenda	Calcutta, Demerara, and New York	1893
" "	Ship Sheila	From West Indies	1894
[2] Sargent, A. H.	Pleione	New Zealand	1892–93
Scale, R. F.	S.S. Laertes	China, viâ Suez	1890–92
[51] Scott, G. P.	Crompton	Colombo and Rangoon	1893
Simpson, Alexander	Barquentine Traveller	Ivigtut	1893
Simpson, Alexander	S.S. Thermopylæ	Melbourne, viâ Cape Town	1893
" "	"	Australia, viâ Cape Town	1893–94
[52] Slade, Albert	County of Inverness	Calcutta	1892–93
Smith, Alexander	Barque Carradale	Algoa Bay, Bangkok	1890–91
[2] " James	S.S. Dunera	Calcutta, viâ Suez	1893
[2] " "	"	" "	1893
[53] " W. J.	R.M.S. Tagus	Brazil	1892–93
[54] " "	"	Buenos Ayres	1893
[55] " "	"	Monte Video	1893
[56] Smyth, M. H., R.N.	H.M.S. Stork	Malta	1893
[57] " W. H.	S.S. Anglian	Mauritius, viâ Cape Town	1893
[58] Spalding, T. F.	S.S. Australasian	Australia, viâ Cape Town	1892–93
[58] " "	"	Melbourne, viâ Cape Town	1893
Streater, R.	Euterpe	Otago	1892–93
Suffern, R.	Craigerne	Cape Town, Newcastle (N.S.W.), San Diego, and Portland (Oregon).	1892–93

	Voyage.	Year.
	...n, viâ Suez - -	1891
	...f British Isles - -	1893
	...y, viâ Suez - -	1893
	...o, Callao, &c., and ...t.	1893
	...S. - - -	1893
	- - -	1893
	...ntic, Halifax, and Nova	1893
	..., Mauritius, and Mada-	1892–93
	- - -	1893–94
	- - -	1892
	- - -	1893
	- - -	1893
	...viâ Cape Town -	1892–93
	...uez - - -	1891
	...iâ Suez - -	1893
	... ,, - - -	1893
	... ,, - - -	1893–94
	...anube, Antwerp, and	1892–93
	...Suez - - -	1890–91
	...res - - -	1892
	...Suez - - -	1891
	- - -	1893
	- - -	1892–93
	...isco - - -	1893
	...uritius - - -	1872–73

...gisters were kept chiefly by Officers, as

... by Messrs. R. Walton, G. Pattrick, and ...Cope.
... Herbert S. Brading, 2nd Officer.
... E. G. W. Cummings.
... Lieut. P. Vaughan Lewes, R.N.
... C. M. Redhead and W. Johnstone.
... J. George, R.N.R., 3rd Officer.
... by H. W. Stump, 3rd Officer.
... by Messrs. Warren, 2nd Officer, Stump, ...fficer, and Cochrane, 4th Officer.
... B. C. Coombe, Navigating Officer.
... J. Vesey Lawther, 4th Officer.
... Sidney G. D. Andrews, Chief Officer.
... T. Gray, Chief Mate.
... J. Sowerby, 1st Mate, and D. Jones, 2nd ...
... Coulton Elliott.
... M. Pearson.
... L. W. Bollard, 5th Officer.
... Evan St. Maur Nepean, Surgeon, R.N.
... Elrington S. McKay, Surgeon.
... by J. J. Murphy and F. Lampard.
... W. H. Taylor, 1st Officer.
... W. S. Preedy, 2nd Officer, and F. W. ... 4th Officer.
... George Adams and H. J. Boby.
... H. J. Boby, 2nd Officer, H. V. Lewis, 3rd ... and E. Simpson, 4th Officer.
... William Bett, Surgeon, R.N.
... B. C. Alleyne, 2nd Officer.
... Andrew Robb, 2nd Officer.
... Navigating Officers.
... Lieut. A. Y. Moggridge, R.N.
... William George Squares, Chief Officer.
... John W. Hague, Chief Officer.
... B. L. Travers, 2nd Officer.
... by Messrs. Hoare, Gace and Coysh.
... by Messrs. Hoare, Gace, Hepburn and ...eld.
... John M. Arnaud.
... James Smith, 1st Mate.

APPENDIX III.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Barometers.	Aneroids.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1893, afloat	227	532	1,396	309	313	185	93
Issued since	80	143	362	80	77	30	28
	307	675	1,758	389	390	215	121
Returned since	65	102	315	45	36	18	31
April 1st, 1894, afloat	242	573	1,443	344	354	197	90

INSTRUMENTS supplied, &c. for use at Naval Stations.

April 1st, 1893, in use	73	65	254	36	38	7	13
Issued since	7	5	48	4	3	3	1
	80	70	302	40	41	10	14
Returned since	3	5	66	8	2	1	3
April 1st, 1894, in use	77	65	236	32	39	9	11

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1894.

Afloat in Royal Navy	242	573	1,443	344	354	197	90
In use at stations	77	65	236	32	39	9	11
In store at M.O.	24	55	48	45	54	9	28
„ Chatham	16	45	81	5	8	11	15
„ Sheerness	6	6	38	14	14	9	6
„ Portsmouth	23	53	143	33	35	13	8
„ Devonport	20	45	126	40	40	16	16
„ Queenstown	2	2	17	—	—	—	4
„ Gibraltar	2	4	11	3	3	—	4
„ Malta	8	12	38	8	11	3	6
„ Bombay	4	4	11	3	3	1	4
„ Halifax	1	6	20	5	4	—	7
„ Bermuda	13	7	24	4	9	2	4
„ Jamaica	6	3	28	—	—	—	—
„ Cape of Good Hope	5	5	27	4	4	3	4
„ Trincomalee	4	3	14	3	3	—	4
„ Hong Kong*							
„ Coquimbo	3	6	17	4	3	1	19
„ Sydney	1	5	12	4	3	1	7
„ Esquimalt	6	7	29	5	6	—	—
Total, April 1st, 1894	463	906	2,358	556	593	275	237
Lost, &c. since April 1st, 1893	4	17	279	46	31	7	10
Under repair	23	4	—	—	—	—	—

* Returns have not been received for June and September quarters 1893.

APPENDIX IV.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Barometers.	Compasses.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1893, afloat - -	116	—	667	—	1	113	378
Issued since - - -	67	—	419	—	—	61	203
	183	—	1,086	—	1	174	581
Returned since - -	77	—	459	—	—	68	241
April 1st, 1894, afloat - -	106	—	627	—	1	106	340

INSTRUMENTS at Stations, viz., Telegraph Offices, Observatories, Fishing Villages, &c.

April 1st, 1893, in use - -	283	2	258	57	64	55	10
Issued since - - -	14	—	38	10	12	2	—
	297	2	296	67	76	57	10
Returned since - -	12	—	29	8	7	1	—
April 1st, 1894, in use - -	285*	2	267	59	69	56	10

DISPOSITION of Board of Trade Instruments on April 1st, 1894.

In merchant ships - -	106	—	627	—	1	106	340
In use at stations - -	285	2	267	59	69	56	10
In store at M.O. - -	39	3	305	20	36	18	123
At Liverpool Agency -	9	—	43	—	—	11	33
„ Aberdeen „ -	5	—	41	—	3	5	30
„ Glasgow „ -	4	—	26	—	—	3	19
„ Dundee „ -	16	—	36	—	—	14	33
„ Hull „ -	2	—	9	—	—	1	4
„ Cardiff „ -	4	—	38	—	—	2	15
„ Southampton „ -	6	—	44	—	—	6	29
Total, April 1st, 1894 -	476	5	1,436	79	109	222	636
Lost, &c. since April 1st, 1893	2	—	114	2	1	33	48
April 1st, 1894	12	—	—	—	—	—	—

* Of these barometers 198 are lent for use of seafaring communities at fishing villages and ports.

APPENDIX V.

Report of Inspection of the Irish and Welsh Stations, 1893.

I have the honour to report that I have completed my usual inspections this autumn. The only stations I have omitted have been Foynes and Kilkenny Castle, both of which furnish data for the Weekly Weather Report only.

Telegraphic Reporting Stations.

Holyhead, visited August 3rd.—The only matter calling for remark here is that the bushes near the rain gauge require to be kept lower, so as not to shelter the gauge from driving rain.

I also inspected the two anemometers, in company with Mr. Galton. Some repairs were needed to the cups of the Robinson instrument, which I ordered to be carried out.

Donaghadee, visited August 8th.—The only change at this station has been that the barometers have been changed to the new Post Office close by the old one. The thermometers have not been changed.

Malin Head, visited August 14th.—I took to this station, where the observer is very careful, the self-recording aneroid formerly at Mullaghmore, and I erected it in the signal tower. The employment of Lloyd's signalmen as our observers is not altogether satisfactory, as at the time of the manœuvres the two duties clashed with each other at this station and elsewhere.

Belmullet, visited August 16th.—At this station the observer was absent on leave. I regret to say that the observations are not as carefully taken as we could wish. I have reprimanded the observer, whom I saw afterwards.

Parsonstown, visited August 22nd.—At this station the observer had recently enlisted, and his brother aged 14 had taken the duty, but of course is as yet inexperienced.

Roche's Point, visited August 23rd.—This station was in good order as usual.

Valencia, visited August 24th.—The records are as usual well kept. The sunshine recorder has been placed on the anemometer tower.

Mr. Cullum has erected some gates, and has brought the place into good order. I have authorised his expending 5*l.* on sanitary improvements, and have also allowed him to put in other gates, at his own expense, if he wishes to do so.

St. Ann's Head, visited August 30th.—This station calls for no remark. Mr. Blake, the senior observer, expects promotion about Christmas.

Stations of the Second Order.

Dublin (*Fitzwilliam Square*), visited August 4th.—This station is as usual in good order, but the shrubs in the garden interfere with air circulation.

Dublin (*Glasnevin Gardens*), visited August 4th.—This station calls for no remark.

Dublin (Mountjoy Barracks), visited August 5th.—This station is in its usual good order. The jackdaws have been taking papers from the sunshine recorder, as had previously happened elsewhere. I have directed that a wire cage be fixed on.

Lissan, visited August 9th.—The observer is the same as in 1892. The thermometer screen has been shifted so as to open to the north. The records are carefully taken.

Armagh, visited August 9th.—I found this station in good order. The anemometer hut on the roof had been moved during the year, and replaced satisfactorily (*vide* my report of 1892).

Colebrooke, visited August 10th.—The station is satisfactory; the reductions are all carried out in this Office.

Londonderry, visited August 12th.—The observer is in arrear with his returns. The thermometers and rain-gauge are in a narrow garden, and bushes interfere with them to some extent.

Markree, visited August 16th.—Mr. Marth's assistant was absent. I found the station in very good order, except that the sunshine recorder was slightly out in azimuth.

Currygrane, visited August 19th.—The observer, S. Leckie, is improving in accuracy, and the records are now well kept.

Arley Cottage, visited August 21st.—Major Maxwell was again absent. The instruments were in fairly good order.

Parsonstown.—See report on Telegraphic Stations.

St. David's, visited August 29th.—This station is, as always, in excellent order.

Weekly Weather Report Stations.

Edenfel, visited August 15th.—Colonel Buchanan absent, but his son was taking the observations, and the instruments were in order.

Killarney, visited August 24th.—Archdeacon Wynne absent. His *locum tenens* was observing, and correctly.

Waterford, visited August 28th.—This station calls for no remark.

Llandovery, visited August 31st.—This station is in good order. Mr. Watkin has, however, better instruments than he has now in use. I hope he will have them set up.

Corrections to be applied to the readings of the thermometers :—

Stations.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare.	Remarks.
Telegraphic Reporting Stations.						
Holyhead	0·0	−0·3	−0·3	+0·3	−0·4	
Malin Head	−0·4	−0·4	0·0	−0·7	−0·6	
Belmullet	−0·2	−0·1	−0·1	+0·1	—	No spare ther.
Donaghadee	−0·4	−0·5	−0·1	0·0	−0·1	
Parsonstown	−0·7	+0·1	−0·2	+0·1	—	Dry bulb (corrected) used as standard.
Valencia (Cahirciveen)	−0·3	−0·3	−0·2	+0·2	−0·1	No. 3580 do. do.
Roche's Point	−0·4	−0·4	0·0	+0·6	—	Dry bulb. do. do.
St. Ann's Head	−0·4	0·1	+0·9	+0·1	−0·1	

Stations.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare.	Remarks.
Weekly Weather Report Stations.						
Londonderry	−0·2	−0·2	0·0	+0·4	—	Max. ther. is new (bought in May).
Edenfel	—	—	+0·4	−0·3	—	
Waterford	−0·1	−0·1	0·0	+0·5	—	
Killarney	−0·4	−0·4	−0·3	−0·1	—	Dry bulb (corrected) used as standard.
Llandovery	—	—	−0·3	+0·5	—	Not graduated on stem.
Stations of the Second Order.						
Armagh	−0·3	−0·4	−1·7	—	−0·2	Grass min. + 1·1. Air min. therm. of Casella's mercurial pattern.
Brookeborough	−0·8	−0·7	−0·1	0·0	—	Grass min. − 1·0.
Dublin (City)	−0·6	−0·6	−1·0	0·0	—	Do. −0·6.
Dublin (Phœnix Park)	−0·4	−0·4	−0·4	+0·1	0·0	
Edgeworthstown	−0·5	−0·5	−0·3	+0·1	—	Do. +0·5.
Glasnevin	−0·3	−0·3	−0·1	+0·5	—	
Lissan	−0·2	−0·4	−0·8	+0·3	—	
Londonderry	−0·2	−0·2	0·0	+0·4	—	
Markree Castle	−0·4	−0·3	0·0	0·0	—	Dry bulb (corrected) used as standard.
Mount Nugent	−0·1	−0·1	+0·9	0·0	—	Do. do.
Parsonstown	−0·7	+0·1	−0·3	+0·1	—	
St. David's	−0·2	−0·3	0·0	+0·2	—	

(Signed) Robert H. Scott.

Report of Inspection of Scottish Stations for Year 1893.

Barometers.

The barometers at the stations were compared with inspector's standard No. 690, which continued to be in good order during the inspection, as shown by a comparison with a standard in Edinburgh at the commencement and again at the close of the inspections. I have to report that the whole of the barometers specified in Table I. are correct, allowance being made for known instrumental errors, are in good order, and are correctly observed.

Table I.

Stations.	Inspector's Standard No. 690 corrected.	Reporting Barometer uncorrected.	Check Barometer uncorrected.	Remarks.
	Inches.	Inches.	Inches.	
Ochterlyre	29·696	29·684	—	
Dundee	29·763	29·760	—	
Braemar	28·972	28·972	—	
Aberdeen	30·160	30·160	—	
Nairn	30·050	30·047	30·050	
Lairg	29·904	29·890	—	
Dunrobin	30·156	30·158	—	
Wick	29·960	29·956	30·022	Check barometer at lower level.
Deerness	29·476	29·480	—	
Stornoway	29·496	29·494	29·494	
Fort Augustus	30·118	30·106	—	
Fort William	29·993	29·976	—	
Laudale	30·414	30·416	30·410	Check barometer in flat above.
Callton Mor	30·074	30·040	—	
Rothesay	29·934	29·396	—	
Ardrossan	30·002	30·004	—	
Pinmore	29·935	29·984	—	
Edinburgh	28·757	28·730	—	
Leith	29·161	29·161	29·164	
Glasgow	29·619	29·619	—	
Carron	29·690	29·650	—	

Thermometers.

The minimum thermometers were carefully examined with the result that all were found in good order with the exception of two. At Rothesay and Ardrossan about one degree of the spirit was lodged at the very top of the tubes, which in each instance was put right by the observer himself under my direction. In both cases the evaporated portion was not very easily seen. All the maximum thermometers were found in good order.

Table II.

Stations.	Standard Thermometer. No. 4453	Dry Bulb.	Wet Bulb.	Spare Thermometer.	Max. Thermometer.	Min. Thermometer.	Time in Water in Minutes.	Change of Temperature.	Remarks.
	°	°	°	°	°	°	/	°	
Ochtertyre -	60·2	0·0	−0·1	—	0·0	−0·1	180	+0·4	Ther. on grass 0°·0.
Dundee -	58·2	−0·6	−0·6	—	+1·4	−0·3	80	+0·5	New hygrometer.
Braemar -	59·1	+0·3	+0·4	—	0·0	−0·2	140	Uniform	
Aberdeen -	61·2	+0·3	+0·3	—	+0·1	+0·3	90	Do.	
Nairn - -	64·0	+0·7	+0·8	—	0·0	−0·2	75	+0·5	
Lairg - -	65·4	+0·3	+0·2	—	−0·2	+0·1	100	Uniform	
Dunrobin -	64·0	−0·5	−0·5	—	0·0	−0·4	55	Do.	
Wick - -	60·8	+0·4	+0·5	—	0·0	0·0	90	Do.	
Deerness -	64·8	0·0	0·0	+0·2	−0·9	−0·2	70	+0·2	
Stornoway -	57·8	+0·5	+0·5	—	−0·6	−0·6	120	+0·2	
Fort Augustus	59·0	+0·1	+0·1	—	+0·2	−0·4	80	Uniform	
Fort William -	59·1	+0·1	+0·1	—	+0·2	0·0	120	Do.	
Do. Observatory -	59·1	—	—	—	0·0	−0·7	120	Do.	
Laudale -	58·1	+0·2	+0·2	—	+0·1	+0·2	100	Do.	
Callton Mor -	64·2	+0·1	0·0	—	+0·8	−0·4	85	+0·2	
Rothesay -	59·9	+0·1	+0·1	—	+0·1	−0·1	80	+0·3	
Ardrossan -	60·1	+0·2	+0·2	—	−0·2	−0·2	110	Uniform	
Pinmore -	60·0	0·0	−0·1	—	−0·2	0·0	95	Do.	
Edinburgh -	52·2	+0·1	0·0	—	0·0	−0·1	90	Do.	
Leith - -	52·8	0·0	+0·1	—	−0·1	−0·5	60	+0·2	
Glasgow -	48·3	—	—	—	−0·1	−0·1	100	−0·4	Ther. on grass −0°·2.
Cargen -	52·7	−0·1	−0·1	—	0·0	−0·2	135	+0·3	

Hygrometers.

The dry and wet bulbs at all the stations were read directly on opening the thermometer screens and the readings compared with the apparent hygrometric conditions at the time, and I am thereby led to report very favourably as to the care with which these observations are everywhere made. At Dundee the hygrometer had been accidentally broken and replaced by one purchased in the town. The errors of the new dry and wet bulbs were ascertained.

Notes of Inspection of the Stations

Ochtertyre, July 25th, 1893.—Everything at this station is in excellent order, and the observer is enthusiastic and accurate.

Dundee, August 17th.—The instruments are in good order and the observations were made carefully and correctly by the assistant who was temporarily in charge. A new hygrometer had recently been procured to replace the old one which had been accidentally broken. Mr John Carnochan was appointed curator of the cemeteries after the death of

Mr. McKelvie, who was so long in charge of this station. Mr. C. evinces much interest in the observations and is desirous of giving all assistance in his power.

Braemar, August 8th.—The instruments are in admirable order, and the observations are made by Mr. Aitken and his two assistants with care and correctness.

Aberdeen, August 9th.—Instruments and observations at this place are all that can be desired.

Nairn, August 12th.—The thermometer screen has just been repainted and repaired, and the instruments generally are in good order. I had some conversation with Miss Penny about the readings of the barometer, dwelling on the necessity there is for systematically checking the accuracy of each observation entered in the journal by a second observation.

Lairg, August 14th.—The instruments are all in excellent order, and the observations made with care and accuracy.

Dunrobin, August 15th.—The instruments continue to be kept in good order, and the observer is careful and attentive.

Wick, August 16th.—Mr. Sinclair has recently been rather seriously ill, and all the observations were consequently made by Miss S., who occasionally neglected to compare the barometer reading entered in the journal with a second observation. This is promised to be rectified. The instruments are in very good order, and Miss S. continues to manifest much interest in the observations.

Deerness, August 18th.—The instruments are all in admirable order, and the observations are made with much care and intelligence.

Stornoway, August 22nd.—The instruments are in good order, and the observations appear to be made with care. The omission recently to enter in the daily telegram a barometric fluctuation shown by the barograph was pointed out, and the necessity of attending to the notification of these fluctuations in future. Considerable additions have been made to the school buildings, and other changes and additions to the present grounds are in contemplation. Meanwhile, instruments remain in their present position till a decision is come to, when they will be shifted to the positions I pointed out in accordance with the decision arrived at.

Fort Augustus, August 25th.—On examination the sunshine recorder was found slightly out of focus, and directions were given as to putting it right, otherwise the instruments are in excellent order, and the observations are made with special care and intelligence by Father Martin, who has resumed the charge of the station.

Fort William, August 25–28th.—A new maximum thermometer was added in November to replace one which had been accidentally broken. The sunshine recorder was removed to its new position September 1st, 1892, where it will remain permanently. Mr. Omond has, during the past two years, empirically determined the varying number of hours of actual sunshine during the days of the year, as these are reduced by the surrounding hills. The results are given in the following Table :—

TIMES OF HOURS SUNSHINE.

	Theoretic.	Observed.	Difference.
January - - -	231	151	80
February - - -	275	193	82
March - - -	365	295	70
April - - - -	426	357	69
May - - - -	506	413	95
June - - - -	529	438	91
July - - - -	528	429	99
August - - -	467	380	87
September - - -	381	315	66
October - - -	319	241	78
November - - -	242	167	75
December - - -	210	125	85
Year - -	4,481	3,497	984

The standard barometer was shifted from the south-west to the north-west wall of the instrument room in July, both positions being at the same height. The instruments are in excellent order, and the observations are punctually and accurately made.

Laudale, August 29th.—The instruments are in remarkably good condition, and the observations are made carefully and correctly. Hitherto the observer has been occasionally revising his observations on a faulty method, which in future is not to be practised.

Callton Mor, August 30th.—The instruments are well kept, and the observations made with great care by Mr. Russell and his assistant.

Rothesay, August 31st.—About a degree of spirit was lodged at top of tube of the minimum thermometer, in a position not readily seen. It was put right by the observer under my direction; otherwise the instruments were in good order and the observations made very accurately.

Ardrossan, August 31st.—The rain-gauge has just been thoroughly repaired, and the Stevenson screen was ordered to be repaired and repainted. About one degree of spirit was lodged at the top of the tube of minimum thermometer. It was put right by the observer under my direction. I have pleasure in reporting that matters at this station are now in a satisfactory state.

Pinmore, September 1st.—The instruments are all in very good order, and the observations made with care and intelligence.

Edinburgh, October 4th.—The sunshine recorder, which was very slightly out of order, was put right. The other instruments were in remarkably good order, and great zeal and intelligence is manifested in conducting the work of the station.

Leith, October 5th.—The rain-gauge and the railing inclosing the instruments were put in a state of thorough repair shortly after last year's inspecton. Everything is in good order, and care and intelligence are shown on the part of the observer and two assistants in making the observations.

Glasgow, October 9th.—Professor Becker, who has succeeded Professor Grant, evinces the greatest interest in the meteorological department of the observatory. The instruments are in remarkably good order, and the work of observing is well attended to.

It is necessary to remove the anemometer from its present position, where it has been since 1868, but it is not yet decided where to place it.

Cargen, October 10th.—A new barometer has been added, to replace the one that has been accidentally broken. The thermometer screen had recently been repainted, and everything about the station is in excellent order, and the observations are well attended to.

(Signed) ALEXANDER BUCHAN.

REPORT of INSPECTION of the ENGLISH STATIONS, 1893.

I have the honour to submit the following Report of the Stations inspected by me in the year 1893:—

TELEGRAPHIC REPORTING STATIONS.

Spurn Head, inspected on April 21st.—All the instruments at this station were in good order, and appeared to be carefully attended to. The dry-bulb, without corrections, occasionally exceeds the maximum.

York, April 22nd.—I think that there is some improvement in the observations at this station, and that they are more punctually taken. There is no other change.

Prawle Point, inspected August 20th.—All the instruments were as usual in good order. The assistant, Mr. Fenton, was absent on the day of my visit.

Scilly, inspected August 22nd.—The observer read the barometers a little low. The hygrometer was rather foul.

Jersey, September 2nd and 3rd.—The observer had been obliged to relinquish his office as railway station master at St. Aubins, and the barometers had been moved to his own house, without however, any appreciable change of altitude above mean sea level. The instruments were in good order. I examined some other sites for both the outdoor and indoor instruments, some remarks about which I supplied to the Meteorological Office in the prospect of Mr. Fisher's having to resign the work of observation.

Hurst Castle, September 6th.—The instruments were all in good condition. Errors have occasionally been made in the readings of the barometers. The remarks made by me in previous reports as to this station remain applicable. I have since learned that Mr. Appleton is about to retire.

Yarmouth, October 24th.—The instruments were all in good order as usual.

Cambridge, October 26th.—The instruments were in fair order, and the new observer seems to me accurate and careful. Wind forces are, as it appears to me, estimated at higher figures since the resignation of Mr. Todd.

Loughborough, October 28th.—Much care is still taken by the observer at this excellent station.

North Shields, November 1st.—Mr. Irvine was absent. I have now no fault to find with the observations at this station, and the barometers were correctly read.

Liverpool, November 7th.—Both Mr. Plummer and Mr. Skinner were absent. The instruments appeared to be in fairly good order. The thermometer corrections seemed to be nearly in accordance with those previously determined by me.

Dungeness, December 22nd.—All the instruments were clean and in good order; and I have no fault to find with the station, except that the observers set the verniers a little too low.

North Foreland, December 27th.—The observer was absent. I called, however, at his lodgings and suspended my standard by the side of the barometer which is there kept, with the conclusion that the latter does not read quite correctly. There is no air in either of the barometer tubes at this station. The thread of spirit in the minimum I found to be broken in several places, and the deputy observer informed me that it was frequently in this condition. A new minimum is, I think, required. All the other instruments were in excellent order.

Second Order Stations.

York, April 22nd.—There is no alteration of any importance at this station. The thermometers, as I have before reported, are in my opinion too crowded.

Plymouth, August 21st.—The barometer was about to be moved to the observer's new house. This promises to be a good station.

Southampton, September 1st.—All the instruments at this station were, as usual, in good order, and appear to be carefully attended to.

Geldeston, October 25th.—Mr. Dowson was absent at the time of my visit. All the instruments were, as usual, in excellent order. The wet-bulb, however, read somewhat high.

Uppingham, October 27th.—The observations are excellently taken. Some of the old thermometer corrections seemed to need alteration, as will be observed from the table.

Durham, November 1st.—The instruments were in very fair condition. Mr. Carpenter is a careful and efficient observer.

Aysgarth, November 3rd.—This station continues to be excellent. The observer has at times been absent. The minimum seems to require a large correction, and is not a very good instrument.

Prestwich, November 5th.—Dr. Clunn, who kindly read the instruments with me, failed to read them quite correctly in water, being very myopic. The deputy overseer only arrived just before I had to leave.

Liverpool, November 7th.—The instruments were in fairly good order, but the wet-bulb a little foul. The observers were absent.

Cronkbourne, November 8th.—Both Mr. Moore and his assistant were absent from the Isle of Man. I found everything in good order at this well-maintained station.

St. Leonard's, December 23rd.—The observations are, in my opinion, very ill-attended to. The wet-bulb was dry and excessively dirty. Doctor Colborne was absent. He has again changed his residence. I was shown the barometer, but was unable to open the case.

Eastbourne, December 23rd.—I found all the instruments in excellent condition and well attended to. The corrections applicable to the thermometers are trivial, and practically unaltered. No interference with the rain-gauge has lately been noticed. The observations are likely to be permanent.

SECOND ORDER STATIONS whose RETURNS are not fully published.

Tealby, October 30th.—The observer has been seriously ill, and I have fears that the station will not be kept up permanently. The instruments were all in good order.

Seaham, November 1st.—Mr. Aird had been taken ill on the morning of my visit. The instruments at the Cemetery grounds were in good order and well attended to; and the hygrometer was no longer dirty. The returns seem to me to be in themselves, as regards condition, worthy of publication, though errors are not infrequent. The proximity of the station to Durham renders, however, these returns of comparatively little value. The station has been continued for a long time, and promises to be permanent.

Manchester, November 5th.—Doctor Tatham was absent. I do not think that his new appointment can lead to any discontinuance of the observations; and I hope that they may be taken in the evening as well as in the morning. The instruments were in good order, and the deputy observer takes great care.

St. Helen's, November 7th.—No returns have yet been sent in. I strongly urged that the work should be begun. The instruments were all in fair order, and I see no sufficient reason why the station should not be a good one.

SELF-RECORDING OBSERVATORIES.

Stonyhurst, November 6th.—The returns from this observatory show gradual but satisfactory improvement, although errors are still not uncommon. The computer read the barometer rather low. The corrections needed for the self-recording thermometers seem trivial.

NEW STATIONS.

Normanhurst (*Matlock*), October 28–29th.—Mr. Smedley informed me that the barometer had been broken and sent back to London. The outdoor instruments are good, but no evening observations are at present taken. The exposure is all that could be desired.

Heysham Hall (*Morecambe*), November 4th.—This new station promises well. The instruments were all in good order. The deputy observer, Mr. S. Lomas, at first read the barometer wrongly; he is intelligent and careful, but unequal at present to hygrometrical reductions. The thermometer screen, made by a Lancaster workman, is, I think, rather too near a greenhouse on the north side of a large vegetable garden. The barometer, a good instrument, is in the house of Mr. Lomas, 10 feet below the outdoor instruments.

Weekly Weather Report Stations.

Besides those of the above stations which send weekly weather reports, I visited *Arlington Court* on August 24th. The observer has been changed since my last visit; and the instruments did not appear to be quite so well attended to, more especially the hygrometer.

Bristol, August 26th.—The observer, J. H. Jones, Esq., F.R.A.S., has regarded the maximum temperatures registered by him as abnormally high. I hesitate to adopt this opinion. All the instruments were in very fair order, and the station promises to be a useful one.

Cirencester, August 28th.—The sunshine recorder is not fixed to the stand, and is evidently, experimentally or accidentally, moved from time to time. Professor Ohm was absent at the date of my visit. The thermometers were in excellent order.

Hesley Hall (*Bawtry*), October 31st.—All the instruments were, as usual, in satisfactory order, and the returns appear to be carefully made.

Alnwick Castle, November 2nd.—The garden instruments are good. The thermometers in the library window are, as I was informed, "corrected by those kept in the gardens." But the latter are not well attended to; and the head gardener is frequently changed. The hygrometer was in a very unsatisfactory condition.

Rainfall Stations.

I visited *Poulton* (*Fairford*) on August 28th.—The station is not ill situated. The gauge is fairly exposed, but stands rather too high above the ground. I spent a long time in giving instructions to the observer who is not well educated.

Market Rasen, October 30th.—There is no alteration at this station. The instrument was in good order, and Mr. Jevons continued to take the readings carefully.

Instruments Employed.

I again employed Adie 590 as a standard barometer at the few stations to which I took a mercurial barometer. One of my two standard thermometers was broken by some passenger who meddled with my instrument case in crossing to Scilly, and I have since employed in its stead Negretti and Zambra's 5077.

Name of Station.	Barometer. Difference of Observers' from Inspector's Readings.	Thermometer. Temperature of Water.	Dry Bulb. Correction to reduce to Inspector's Standards.	Wet Bulb. Correction to reduce to Inspector's Standards.	Difference of Wet from Dry Bulb.	State of Hygrometer.	Maximum. Correction to reduce to Inspector's Standards.	Minimum. Correction to reduce to Inspector's Standards.	Spare on Grass. Correction to reduce to Inspector's Standards.	General Condition.	Name of Station.
Alnwick Castle -	—	47°	+0·8	+1·2	−0·4	C	−3·0	−2·0	—	C	Alnwick Castle.
Arlington Court -	—	61	−0·4	−0·5	+0·1	C	−0·4	−0·1	—	C	Arlington Court.
Aysgarth - -	·000	52	−0·1	−0·7	+0·6	A	−0·8	−1·2	—	A	Aysgarth.
Bristol - -	—	62	−0·4	−0·4	0·0	A	−0·1	−0·3	−0·2	A	Bristol.
Cambridge - -	−·001	51	−0·6	−0·5	−0·1	A	−0·9	+0·1	—	A	*Cambridge.*
Cirencester - -	—	61	−0·1	−0·2	+0·1	A	−0·1	−0·1	0·0	A	Cirencester.
Cronkbourne - -	−·002	40	−0·4	−0·3	−0·1	A	0·0	+0·2	−0·1	A	Cronkbourne.
Dungeness - -	−·003	45	−0·1	0·0	−0·1	A	0·0	−0·2	—	A	*Dungeness.*
Durham - -	−·001	46	−0·4	−0·4	0·0	A	−0·2	+0·4	—	A	Durham.
Eastbourne - -	—	46	0·0	−0·2	+0·2	A	−0·2	0·0	—	A	Eastbourne.
Geldeston - -	−·001	51	−0·3	−0·6	+0·3	A	−0·1	−0·1	—	A	Geldeston.
Hesley Hall (Bawtry)	—	51	−0·6	−0·1	−0·5	A	−0·2	−0·1	—	A	Hesley Hall (Bawtry).
Heysham Hall -	−·009	51	−0·3	−0·1	−0·2	A	−0·1	+0·2	—	A	Heysham Hall.
Hurst Castle - -	−·003	61	−0·8	−0·2	−0·6	A	−0·8	−0·1	—	A	*Hurst Castle.*
Jersey - -	−·002	62	−0·2	−0·5	+0·3	A	+0·4	+0·1	—	A	*Jersey.*
Liverpool - -	—	44	−0·1	0·0	−0·1	B	−0·2	+0·2	—	B	*Liverpool.*
Liverpool - -	—	44	−0·1	0·0	−0·1	B	−0·1	+0·2	—	B	Liverpool.
Loughborough -	−·001	52	−0·4	−0·4	0·0	A	−0·4	−0·3	+0·3	A	*Loughborough.*
Manchester - -	−·001	47	0·0	−0·1	+0·1	A	+0·4	+0·1	—	A	Manchester.
Matlock - -	—	51	−0·1	0·0	−0·1	A	+0·2	−0·2	—	A	Matlock.
North Foreland -	+·004	43	−0·4	0·0	−0·4	A	−0·2	0·0	−0·2	A	*North Foreland.*
North Shields -	−·002	53	−0·1	−0·1	0·0	B	−0·1	+0·1	—	A	*North Shields.*

Name of Station.	Barometer.	Thermometer.									Name of Station.
	Difference of Observers' from Inspector's Readings.	Temperature of Water.	Dry Bulb. Correction to reduce to Inspector's Standards.	Wet Bulb. Correction to reduce to Inspector's Standards.	Difference of Wet from Dry Bulb.	State of Hygrometer.	Maximum. Correction to reduce to Inspector's Standards.	Minimum. Correction to reduce to Inspector's Standards.	Spare on Grass. Correction to reduce to Inspector's Standards.	General Condition.	
Plymouth	−·001	66°	−0·1	−0·6	+0·5	A	0·0	+0·3	−0·1	A	Plymouth.
Prawle Point	·000	67	−0·2	−0·7	+0·5	A	−0·1	−0·2	0·0	A	*Prawle Point.*
Prestwich	—	48	−0·5	−0·1	−0·4	A	−0·2	+0·3	−0·2	A	Prestwich.
St. Helen's	+·002	50	−0·2	−0·2	0·0	A	−0·3	+0·1	—	A	St. Helen's.
St. Leonard's	—	50	−0·7	−0·9	+0·2	C	0·0	+0·1	—	C	St. Leonard's.
Scilly	−·002	65	−0·7	−0·6	−0·1	B	−0·5	−0·3	—	B	*Scilly.*
Seaham	+·002	40	−0·6	−0·4	−0·2	A	−0·1	−0·3	—	A	Seaham.
Southampton	−·001	63	−0·2	−0·2	0·0	A	−0·2	−0·2	−0·1	A	Southampton.
Spurn Head	·000	48	−0·7	−0·4	−0·3	A	0·0	0·0	—	A	*Spurn Head.*
Stonyhurst	−·004	—	−0·1	−0·3	+0·2	A	0·0	+0·1	—	B	Stonyhurst.
Tealby	−·001	45	−0·4	−0·2	−0·2	A	−0·6	+0·4	−0·1	A	Tealby.
Uppingham	·000	55	−0·3	0·0	−0·3	A	−0·5	−0·2	—	A	Uppingham.
Yarmouth	+·001	50	−0·1	−0·5	+0·4	A	−0·5	−0·1	—	A	*Yarmouth.*
York	·000	53	−0·7	−0·7	0·0	A	−0·1	0·0	—	A	*York.*
York	·000	53	−0·7	−0·7	0·0	A	−0·4	0·0	—	A	York.

(Signed) W. Clement Ley.

REPORTS on INSPECTIONS of OBSERVATORIES, &c.

To R. H. Scott, Esq., F.R.S.

DEAR SIR, Kew Observatory, October 27, 1893.

I BEG to submit the following report to the Meteorological Council concerning their self-recording instruments at the various observatories and anemograph stations, inspected on the days named :—

Yarmouth, August 16th–18th.—The anemometer at this station having been reported to be out of order, I was instructed to go down to Yarmouth as soon as arrangements could be made with Mr. Chree for me to leave the Observatory. Accordingly I left Kew on August 16th, and called upon Mr. Watson at the Sailors Home, who has charge of the anemograph.

After carefully examining the recording apparatus, I came to the conclusion that the irregularity in the trace shown on the sheet for August 10th was due to the clamping screw (which had become very much worn) not gripping the spindle of the cylinder with sufficient force, so that the pressure of the pencils, combined with a shift in the direction of the wind, no doubt caused the cylinder to slip back from time to time. This I had put right by a local clockmaker, and then dismounted the external parts of the anemometer (which had been well attended to in oiling), and, after cleaning and examining the orientation, the instrument was started on the 17th, and the curve taken off on the following morning showed that the defect had been remedied.

Glasgow, August 31st to September 2nd.—The wet-bulb standard thermometer No. 709 having been accidentally broken at this observatory, another standard, No. 711, was ordered to be taken down from Kew to replace it. This I did, and fitted up the new one in the thermograph screen, after making some slight alterations in the metal mounting.

There is one spare thermograph tube at the observatory for use in case of breakage, but no scales have yet been constructed for tabulating the photographic curves derived from the new dry and wet tubes which were fitted up by me in April 1892.

When examining the thermograph clock and lenses, I improved the definition of the zero-lines, and also rectified the action of the light stop, which had failed to cut off the light from time to time.

The barograph clock was oiled and the instrument generally attended to, and the vent-hole in the cistern was found to be quite free.

The external parts of the anemometer were dismounted and cleaned, and all the bearings lubricated with fresh oil. After examining the clock and recording apparatus, the orientation was duly tested, and the observer instructed to prepare, and send in each month, an orientation paper.

As requested, I examined some of the anemograph and rain-gauge tracings. The former tracings were found to be exact copies of the originals, but the latter were not, inasmuch as the assistant had carried the trace down to the full extent of the scale and fully up to the zero-line, as will be seen by the tracings accompanying this report (not reproduced here).

This appears to have always been done, but I requested Mr. Connell to send in for the future facsimiles of the curves. After oiling and cleaning the friction rollers of the rain-gauge, I found by experiment that the pencil, when lighly pressing against the paper, descended to the full extent of the scale, although it did not return again to the zero line but this gauge is *not provided* with a Stonyhurst discharger.

The various thermometers were compared with the Kew standard thermometer No. 682 at 55 degrees, and their corrections found as follows :—

Dry standard 708	-	-0.1°
Wet „ 711	-	$+0.1^{\circ}$
Maximum 58846	-	$+0.1^{\circ}$
Minimum 63942	-	-0.1°
„ (for grass) 59008	-	-0.1°
Standard barometer - } Attached thermometer } No. K.O. 2479	-	-0.5°
Barograph thermometer (no number)	-	-0.8°

The Mason's hygrometer, which was used in the screen, temporarily, in place of the broken thermometer, was also examined :—

Dry bulb, 2847	-	-0.5°
Wet „	-	-0.5°

Aberdeen, September 4th–6th.—The two new thermograph tubes ordered to be sent down to this observatory from Kew were safely conveyed by me, and on September 4th No. 1 was fitted up to replace the broken wet bulb tube, whilst the other (No. 3) was carefully put away for future use when required. The curves developed on the following morning showed that the new tube had been successfully adjusted, and that the records were satisfactory.

To obviate any further danger of breakage, Mr. Boswell placed a small piece of zinc over the hole in the wall at the back of the screen to prevent any stray bird from resting there.

Although the barograph and thermograph were going well, the clocks required cleaning as well as the lenses. These operations were duly carried out, and the thermometers were compared in pounded ice, with the following results :—

Dry bulb 397, read	-	32.1°	correction -0.1°
Wet „ 395, read	-	32.6°	„ -0.6°
Maximum 1002, read	-	32.0°	„ 0.0°
Minimum 5056, read	-	31.9°	„ $+0.1^{\circ}$
Attached thermometer (to standard barometer) 71061, read	-	32.2°	„ -0.2°
Barograph thermometer (no number)	-	34.0°	„ -2.0°

The anemometer was dismounted and all parts cleaned, the different bearings being afterwards replenished with sperm oil. The orientation was examined, and squeezes taken of both the spare and self-recording rain-gauges after the latter had been examined and the various parts cleaned and oiled.

Deerness, Orkney, September 8th–9th.—At this station the anemograph was inspected on September 8th, but through a misunderstanding as to the exact date of my visit Mr. Spence was absent.

I had the exterior parts entirely dismounted, and found that the various bearings were all well oiled, and the instrument had been care-

fully looked after. The curve taken off the cylinder on the morning of my visit was not altogether satisfactory, but this, I think, was owing to the assistant not having clamped the clock sufficiently tightly to the cylinder when starting the instrument on the previous day.

The clock was taken to pieces and cleaned, the recording apparatus oiled, and afterwards the orientation was examined and found correct.

On the following morning I drove over again from Kirkwall and found that the anemometer had gone all right, and Mr. Spence, who had returned home that day, called my attention to a slight defect in the direction-pencil, but unfortunately I had no emery buff with me to correct it. Since my return, however, I have sent out two emery buffs to Mr. Spence, in case the end of the pencil still requires to be slightly rubbed down.

The observer was instructed to adjust the sheet upon the cylinder so as to make the traces fit the printed forms.

The sun recorder was in good order.

Fort William, September 13th–15th.—The clocks of both the barograph and thermograph were taken to pieces and cleaned. The lenses, condensers, and mirrors received the usual attention, and the zero dots were changed to the winter position. The intensity of the photographic traces was also much improved after the mirrors, &c., had been cleaned.

The thermometers were compared with the Kew standard No. 682, and found to have the following corrections at 60 degrees:—

Dry bulb 671 - - - - -	0°·0
Wet „ 672 - - - - -	−0·2
Barograph thermometer, K.O. 6-90 - - -	−2·2
Standard barometer, attached thermometer No. 72222	−0·1
Maximum 1092 - - - - -	+0·1
Minimum 1322 - - - - -	+0·7

Note.—As the minimum thermometer was reading low, I dismounted it from the scale and slightly heated the chamber end over a lamp and after standing the tube in a vertical position for some three hours, the following correction was found:—

Minimum 1322 - - -	+0·8

My special attention having been directed to the unsatisfactory action of the self-recording rain-gauge, I suggested to Mr. Omond the advisability of entirely dismounting the instrument and fitting it up temporarily in the observatory, as the weather at the time was stormy.

After cleaning the clock we again tested the capacity of the receiver which was found to agree with the original value given, of 0·18 inch.

Experiments were then made with the Stonyhurst discharger, when it was discovered that the float did not exert sufficient lifting power to push the pencil up to the zero line after a discharge of 0·18 inch. We found that the position of the float in the discharger was adjusted for a fall of 0·20 inch, so that the amount of rain (0·18) passing in from the receiver did not rise to a sufficiently high level.

As a ready way of getting over the difficulty we put a number of pebbles of suitable size into the bottom of the discharger, thereby raising the level of the water and the float was then found to act perfectly in forcing the pencil up to the zero-line.

As regards the difference shown between the trace and the amount measured in the glass, the former being less, I think that this was principally due to friction, as the instrument badly required cleaning. After filtering the mercury and cleaning the friction rollers, which had become somewhat sticky, the free action of the float carrying the pencil was considerably improved.

Alnwick, September 18th.—I visited Alnwick Castle on September 18th by appointment with H. J. Willyams, Esq., who has succeeded Colonel F. Holland in the service of His Grace the Duke of Northumberland. Through the kind courtesy of Mr. Willyams, every facility was afforded me for examining the anemometer, though unfortunately the weather was unsettled and rainy at the time.

The anemometer is erected on one of the turrets on the roof of the Castle, and, by means of a considerable amount of shafting, is connected to the recording apparatus which is placed in the library.

The exterior parts of the instrument appeared to be well oiled, and are attended to from time to time by the resident mechanic. On examining the recording apparatus I found that the direction-pencil was a few points out of orientation, but after some little difficulty this was put right, and on testing the four principal points it registered satisfactorily.

The exposure of the anemometer is fairly good for all winds, excepting those coming from the N.N.W., N., and N.E. When the direction is in any of these quarters the flag-tower to the N.E., which is in close proximity to the instrument, causes eddies to sweep round the tower and turrets to such a degree that the direction-vane frequently makes a complete turn round the compass, so that the record is not of much value.

The observer's attention was called to the times of starting, and also to the desirability of more care being exercised in tracing the curves.

From an inspection of these it was evident that the clock lost considerably in the course of the day. I endeavoured to shorten the length of the pendulum, but was unable to do so as the bob had become firmly rusted in.

I suggested that this should be seen to by a local clockmaker.

North Shields, September 19th–20th.—The anemometer here was found working very well, and is in excellent order, neither the fans nor the cups showed any signs of wear. I entirely dismounted the instrument and had every part cleaned, and all the bearings lubricated with fresh sperm oil; afterwards the orientation was examined and found correct.

Fleetwood, September 22nd–23rd.—At this station the anemograph was in good working order, and, as usual, well attended to by Mr. Gaulter.

On examining the direction fans I found that one of the blades had become unsoldered; this was put right before leaving. The cup-arms, and stays did not show any signs of wear.

The external portions of the instrument were thoroughly cleaned and oiled, as well as the clock and recording apparatus. Afterwards the orientation was duly examined and found correct.

Stonyhurst, September 25th–26th.—Here I found the photographic instruments in good order, but had the thermograph clock dismounted and cleaned and attached a new line to the barrel; also the barograph was examined and the usual cleaning of lenses, &c. performed.

The zero-lines of the thermograph were shifted to the winter position and the intensity of the dots of light improved.

Afterwards the various thermometers were compared by means of Kew standard 682 and found to have the following corrections at 52° Fahr.:—

Dry bulb 619 - - - -	—0°1
Wet „ 382 - - - -	—0·4
Maximum 1525 - - -	0·0
Minimum 501 - - - -	+0·2

I also tested the maximum and minimum thermometers fitted up in the Glaisher stand and found the corrections to be

For Maximum 7310 - - -	—0.4
For Minimum 48587 - - -	0·0

The extreme temperature values supplied to the Registrar-General are derived from the readings of these latter instruments, and it is evident from this comparison that the large differences shown in April, May, and June, between the extreme readings as published in the Registrar-General's report and those published by the Meteorological Council are not due to instrumental errors, but rather to the different exposures.

The Glaisher stand is erected on the lawn and is fully exposed to the sun's rays for the greater part of the day, so that the effects of radiation must be very considerable, whereas the thermograph screen is fixed to the north side of the observatory, and is almost entirely protected from the sun, and the readings sent to the Meteorological Office are derived from the thermometers placed in this screen.

The anemometer was dismounted and cleaned and the various bearings renewed with fresh oil. The observer was instructed to send up an orientation sheet once a month, and his attention was called to the entry of the times of changing the papers. The defect in the recording-pencils noted from time to time in marking, I think, must be due to an irregularity in the surface of the cylinder, though Father Sidgreaves rather inclines to the belief that the pencils are faulty.

After cleaning and oiling the recording parts, I put a fresh sheet on the cylinder, lowered the pencils, and slowly revolved the drum by hand through the 24 hours, this was repeated some 14 times, taking care to have a fresh position at starting, and from an inspection of the experimental sheet marked A there is a general tendency of the pencil failing to mark during the midnight hours. If the records are still defective I would respectfully suggest that the cylinder and pencils be dismounted and sent to the makers, who could readily examine the cylinder in a lathe.

As regards the rain gauge pencil failing to rise to the zero line, this is mainly due to the fact that the discharger is nearly worn out. It was the first one made, and was only roughly put together at the College. It has now been in use over 20 years and is practically worn out. I would therefore recommend that a new one be supplied.

Holyhead, September 28th–29th.—At the date of my visit here the weather was very stormy, a strong westerly gale having set in with heavy rain, but fortunately Mr. Cotton had re-erected the anemometer (which had been under repair) on the previous afternoon, and the curve which came off on the morning of the 28th appeared fairly satisfactory.

Notwithstanding the high wind, I managed to examine the exterior parts of the instrument, and found that the bearings were all well oiled, but the direction-fans were working rather stiffly; this was owing to

the bearings being screwed up too tightly. The interior recording parts were cleaned and the orientation was tested and found correct, and the observer instructed to make a mark with the pricker at the time of starting.

(Signed) T. W. Baker.

Report on Inspection of the Observatories at Falmouth and Oxford, 1893.

Falmouth Observatory, visited August 14th–17th.—All the instruments were found in very fair condition and well attended to.

The anemograph has been kept well oiled wherever it was possible to do so without disturbing the instrument, but on dismounting the exterior portion, the oil in platform containing the direction roller bearings was found almost dried up, and what little was left had thickened. This was all removed, and, after thorough cleaning, filled up with fresh asbestoline.

The clock and recording parts were also examined and cleaned, and the orientation tested by local marks and by compass bearings.

The endless screw of the direction-spindle begins to show marked signs of wear, and will eventually require renewal.

The check-piece fitted to the rain-gauge, to prevent the pencil rising beyond zero-line of curve paper, was found to have worked loose; this was made rigid.

The cylinder platform was noticed to be revolving dangerously close to the "stop"; the latter was bevelled off to allow more room.

The pencil used—which gives good traces—is a Wolff's "Spanish Graphite," carefully pointed each time the curve is changed, and the least necessary pressure used to cause it to record clearly.

Mr. Kitto pointed out that the screw fixing this pencil in its holder was quite worn out. A new one was procured locally, and fitted to holder next day.

Examination showed that some of the wooden stakes used to secure the "check" rain-gauge had decayed, rendering the instrument liable to move in high winds. Fresh supports were driven in, gauge made firm and carefully levelled, and a "squeeze" taken of rim of funnel.

The instrumental portions of the barograph and thermograph were in good order, but the escapements of both clocks required cleaning, which was done. Some difficulty having recently been experienced in altering the length of the barograph pendulum, I examined same, and found that the thread taking-into-rating nut was rusted; after soaking it in oil for some time this was remedied.

The dial divisions on both these clocks are becoming very difficult to read, and fresh enamelled dials would be a great improvement.

The bulbs of the thermometers are 3 feet 4 inches above the ground.

The thermometers were all compared with my standard at a temperature of 65°, and the following corrections determined:—

Dry,	No. 383	-	-	=	$-0^{\circ}\cdot5$
Wet,	„ 383	-	-	=	$-0\cdot3$
Maximum,	„ 104	-	-	=	$-0\cdot4$
Minimum,	„ 308	-	-	=	$-0\cdot1$

Height of barometer above sea level - =183 feet.
„ rain-gauge „ „ - =169 „
„ anemograph cup „ - =about 210 feet.

Radcliffe Observatory, Oxford, visited August 30th.—Mr. Stone was absent, but his chief assistant, Mr. Wickham, courteously rendered every assistance.

All the instruments were found in good order and working satisfactorily.

I examined the clocks, &c., and oiled the escapements.

It having been rather difficult to read the thermometer attached to the standard barometer at low temperatures, it was with some trouble and risk removed, and then raised in its shield-tube, so as to bring the scale divisions, at about 32°, better into view.

I made a comparison with my standard of the various thermometers in use, and the following corrections were given:—

Dry-bulb standard, No. 576 (in thermograph screen)	-	=	−0·1
Wet	„	„ 575	„	„	-	=	−0·2
Dry thermometer B.T. 1710 (in Stevenson's screen)	-	=	−0·3
Wet	„	B.T. 1709	„	„	-	=	−0·3
Maximum	„	M.O. 356	„	„	-	=	−0·3
Minimum	„	M.O. 363	„	„	-	=	+0·1

(Signed) E. G. CONSTABLE.

Kew Observatory,
October 1893.

APPENDIX VI.

Method of Dealing with Telegraphic Weather Intelligence.

The operations connected with the preparation and issue of the Forecasts and Storm Warnings have not undergone any material change. Full details will be found in Appendix X. to the Report for 1891.

Daily Weather Report.

An important change has been made during the past year in the Daily Weather Report, as two telegrams are now received daily from P. Delgada, in the Azores, forwarded by the courtesy of the Portuguese Meteorological Authorities. The service is at present too new for any detailed report as to its value to be submitted. A detailed description of the Report is given in the Annual Report for 1887, and subsequent alterations have been noticed in the more recent Reports. The Report fills four large quarto pages as before.

The standing portions (maps, &c.) are printed in blue, while the information for each day is in black.

The subscription for the Report is—

For delivery by hand, where feasible, £2 *per annum;*
„ *by book post* £1 „

MS. copies of the observations and remarks can be supplied at the rate of 2*l.* 10*s.* per annum. Arrangements can also be made for the supply of charts drawn from the 8h. a.m. or 6h. p.m. observations, such as appear in the "Times."

The Office receives, when the telegraphic communications are perfect, fifty-eight reports each morning, seventeen each afternoon (except on Sundays), and twenty-nine each evening, the arrangement of which is explained in the Annual Reports for recent years.

The Monthly "Correction and Addition List" is published as before.

Weekly Weather Report.

The Weekly Weather Report, which has appeared since February 1878, and was re-arranged at the commencement of 1890, is prepared for the calendar week, Sunday to Saturday. It is published regularly on Thursdays and is illustrated by three maps for each day. These, like the Daily Reports, show the outline of the land and sea in blue, while the information on them is in black. The maps show (1) for 8 a.m., the temperature, weather, and sea disturbance; and (2) for 8 a.m. and 6 p.m., the distribution of pressure and the winds, over, and on the coasts of, Europe. The information on the first and second pages of each report has been increased, and consists of observations of Temperature and Rainfall made at 79 stations, the individual values for which are given on the second page of the Report, and of Sunshine records taken at 47 stations.

Tables of *Accumulated Temperature*, designed to give persons engaged in agriculture better means of estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer, are published on the first and second pages, and show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively, of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard, or *base temperature*. The base value adopted is 42° Fahr.

Accumulated Temperature is expressed in *Day-degrees;* a Day-degree signifying 1° F. of excess or defect of temperature above or below 42° F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours. An explanation of the rules by which it is obtained will be found in the Annual Report for 1889, while full details as to the facts on which the rules are founded are published in Appendix II. to the Quarterly Weather Report for 1878.

In addition to the reports from the Telegraphic Reporting Stations, and the returns from the self-recording Observatories, weekly schedules from 56 volunteer observers are used, the names of the stations and observers being given in App. XI., p. 64.

The MS. of the report is prepared on Tuesday in every week, and the summary on its first page is sent to several papers on that evening; the printed copies of the complete report are ready for sale on Thursday afternoon.

Appendices, &c.

Two Appendices, I. and II., have appeared, similar to those for recent years. The Monthly Summary Supplement has been improved by the addition to its Tables of Columns showing the difference between the Pressure, Temperature, Rainfall, and Bright Sunshine of the current month, and the means for the corresponding months in a long series of years.

Issue of Forecasts.

There has been an important change in this work, the Board of Agriculture having forwarded the 3.30 p.m. daily forecasts to the rural parts of Northumberland and Essex, p. 12.

Remarks on the actual state of the weather, and forecasts *for not more than one day in advance*, are prepared at the Meteorological Office as under:—

*On Week Days.**

(1.) At 11 a.m. (from the morning reports), for the 24 hours ending at Noon on the day following the date of issue. These are intended especially for the early editions of the evening papers, for the clubs, and for exhibition at certain selected stations. See page 10.

(2.) At 3.30 p.m. (from the morning and afternoon reports), for the day following that of issue. This set of forecasts is not intended for publication in newspapers, but a copy is exhibited regularly at the door of the Meteorological Office, and during the Hay Harvest they are telegraphed to about 28 well-known agriculturists, to be made known in their neighbourhoods, see p. 11, and to the Board of Agriculture for transmission to certain counties in England (see p. 12).

(3.) At 8.30 p.m. (from the 8 a.m., 2 p.m., and 6 p.m. reports), for the day following that of issue. These are supplied gratis to any newspaper or news agency which may apply for them, and send for them regularly. A very large number of the more important papers and news agencies avail themselves of this advantage.

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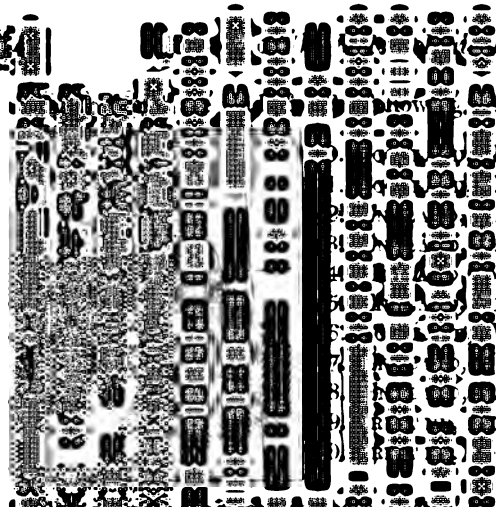
* Good Friday and Christmas Day are reckoned as Sundays.



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* Sundays are reckoned as Sundays.

Inquiries as to the Weather.

Inquiries Personally or by Messenger.—Any person applying at the Meteorological Office between 11 a.m. and 8 p.m. on week days, and between 7 p.m. and 8 p.m. on Sundays,* can be supplied, in writing, with the latest information in the possession of the Office and with the latest forecast issued for any specified district, on payment of one shilling for each inquiry.

Inquiries by Letter.—Application may be made by letter, enclosing thirteen pence in stamps if the reply is to be *by post*, and one shilling in stamps, in addition to the cost of the reply (consisting of ten words, exclusive of the address) if the reply is to be *by telegraph*.

Inquiries by Telegraph.—Any person may obtain *by telegraph* from the Metoorological Office the latest information as to the weather in any district of the United Kingdom by payment of a fee of 1*s*. in addition to the cost of a telegram and reply to any post office. The telegram containing the inquiry must be addressed as follows:

To

Weather,

London.

The payment for the reply should be for at least ten words in addition to the address.

Application may also be made for similar information to be sent either *by telegraph* or *post* on some future specified day.

Checking of Forecasts and Storm Warnings.

The forecasts and storm warnings issued by the Office are carefully checked by being compared with the conditions actually experienced during the time to which they refer. The method adopted was fully explained in the Annual Report for 1891, and the results for 1893 will be found on p. 14.

In order to render the information in the possession of the Office as to the weather experienced on our coasts still more complete, the Council have, as in preceding years, obtained from the various Lighthouse Boards the original log-books from some of the most exposed light-ships and lighthouses. They again express their cordial thanks for the co-operation so readily granted to them by these Boards.

* Good Friday and Christmas Day are reckoned as Sundays.

APPENDIX VII.

REPORT ON THE COMPARISON OF THE FORECASTS ISSUED AT 8h. 30m. p.m. WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1893 to March 1894. The results are for the United Kingdom as a whole.

The letters used have the following signification :—

a = complete success.
b = partial (more than half) success.
c = partial failure.
d = total failure.

The checking has been conducted on the same system as that employed in previous years, *i.e.*, each forecast has been considered under the separate headings of "Wind" and "Weather," but the results of the 8.30 p.m. Forecasts only are here published.

The first column gives the per-centage of success in "Wind," the second in "Weather," and the third the average of the two.

The Summary for the various districts is given at page 10.

Months.		Per-centages.				Months.		Per-centages.			
		Wind.	Weather.	Average.	a + b.			Wind.	Weather.	Average.	a + b.
April	a	59	75	67	88	October	a	44	59	52	80
	b	23	18	21			b	28	28	28	
	c	13	4	8			c	18	8	13	
	d	5	3	4			d	10	5	7	
May	a	63	71	67	87	November	a	49	68	59	85
	b	24	15	20			b	30	23	26	
	c	8	9	8			c	13	8	11	
	d	5	5	5			d	8	1	4	
June	a	61	64	63	85	December	a	49	60	55	81
	b	24	21	22			b	24	28	26	
	c	10	11	11			c	22	6	14	
	d	5	4	4			d	5	6	5	
July	a	54	62	53	82	January	a	35	66	51	82
	b	25	23	24			b	36	27	31	
	c	13	12	13			c	19	4	12	
	d	8	3	5			d	10	3	6	
August	a	59	65	62	84	February	a	52	67	60	84
	b	24	20	22			b	24	25	24	
	c	12	9	11			c	18	6	12	
	d	5	6	5			d	6	2	4	
September	a	46	66	56	86	March	a	51	65	58	85
	b	32	27	30			b	28	25	27	
	c	11	3	7			c	13	6	9	
	d	11	4	7			d	8	4	6	

(*continued.*)

(*continued from p. 56.*)

		Per-centages.			
		Wind.	Weather.	Average.	a + b.
The entire year	a	52	66	59	84
	b	27	23	25	
	c	14	7	11	
	d	7	4	5	

APPENDIX VIII.

Telegraphic Weather Intelligence.

The Meteorological Office issues notices of atmospherical disturbances on or near the coasts of the British Islands (free of charge) to ports and fishing stations recommended by responsible local authorities.

The fact that one of these notices has been received at any station, is made known by hoisting a black canvas cone, 3 feet high and 3 feet wide at base, which has the appearance of a triangle when hoisted. The telegram directing the cone to be hoisted should be exhibited near the signal staff.

At dusk, whenever a signal ought to be flying if it were daylight, a night signal consisting of three lanterns hung on a triangular frame, may be hoisted in place of the cone.

The Meteorological Office supplies the canvas cone, but does not undertake to supply the lanterns. In all cases the local authorities must undertake the charges incidental to the hoisting of the signal, such as flagstaff and gear, oil, &c., and also as to the keeping of the apparatus in repair, painting, &c.

The following is a list of the stations at which the signals are hoisted. They are situated, 101 in England and Wales, 47 in Scotland, 21 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands :—

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.E.	IRELAND, S.W.	ENGLAND, S.W.	ENGLAND, E.
Lerwick.	New Ross.	Scilly.	Harwich.
Scalloway.	Dunmore East.	St. Sennen.	Ipswich.
Dunrossness.	Dungarvan.	Newlyn, West.	Southwold.
Stromness.	Youghal.	Penzance.	Yarmouth.
Kirkwall.	Queenstown.	The Lizard.	Cromer.
Holborn Head.	Passage.	Falmouth.	Sheringham.
Dunnet Head.	Cork.	Pendennis.	Lynn.
Wick.	Kinsale.	Mevagissey.	Sutton Bridge.
Avoch.	Do. (Old Head).	Devonport.	
Inverness.	Brow Head.	Plymouth.	
Nairn.	Tralee.	Prawle Point.	
Burghead.	Limerick.	Teignmouth.	
Lossiemouth.	Galway.	Exmouth.	
Buckie.			
Port Knockie.	IRELAND, N.W.		
Cullen.	Rathmullan.		
Portsoy.	Malin Head.		
Banff.	Portrush.	ENGLAND, S.	ENGLAND, N.E.
Fraserburgh.	Port Ballintrae.	Guernsey.	Boston.
Peterhead.		St. Helier's (Jersey).	Cleethorpes.
Aberdeen.		Gorey (Jersey).	Grimsby.
	IRISH SEA.	Weymouth.	Goole.
	Belfast.	Poole.	Hull.
SCOTLAND, E.	Donaghadee.	Cowes.	Bridlington Quay.
Stonehaven.	Howth.	Ryde.	Flamborough Head.
Montrose.	Kingstown.	St. Catherine's Point.	Filey.
Broughty Ferry.	Ramsey (I. of M.).	Portsmouth.	Whitby.
Dundee.	Douglas "	Southampton.	Redcar.
St. Andrews.	Castletown "	Littlehampton.	Middlesborough.
Anstruther.	Silloth.	Brighton.	West Hartlepool.
Pittenweem.	Maryport.	Newhaven.	Sunderland.
Burntisland.	Workington.		South Shields.
Grangemouth.	Whitehaven.		Tynemouth.
Bo'ness.	Barrow.		Berwick - on - Tweed.
Granton.	Morecambe.		
Newhaven.	Fleetwood.		
Leith.	Blackpool.		
Fisherrow.	Lytham.		
Dunbar.	Preston.		
Cockburnspath.	Southport.	ENGLAND, S.E.	
St. Abb's Head.	Liverpool.	Eastbourne.	
Eyemouth.	Runcorn.	Hastings.	
	Connah's Quay.	Rye.	
	Penmaenmawr.	Sandgate.	
	Port Penrhyn.	Folkestone.	
	Port Dinorwic.	Dover.	
	Carnarvon.	Ramsgate.	
	Holyhead.	North Foreland.	
		Margate.	
	ST. GEORGE'S CHANNEL.	Faversham.	
	Aberystwith.	Sheerness.	
	Milford.	Chatham.	

[*continued.*

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.W.	BRISTOL CHANNEL.		
Stornoway.	Pembrey.		
Port of Ness (Island of Lewis).	Llanelly.		
	Swansea.		
	Briton Ferry		
	Porthcawl.		
	Penarth.		
	Cardiff.		
	Do. Barry Dock.		
SCOTLAND, W.	Newport.		
Glasgow.	Weston-super-Mare.		
Greenock.	Burnham.		
Rothesay.	Bridgewater.		
Campbelton.	Ilfracombe.		
Girvan.	Lundy Island.		
Ballantrae.	Barnstaple.		
	Appledore.		
	Boscastle.		
	Port Isaac.		
	Newquay.		
	Hayle.		
	St. Ives.		

APPENDIX IX.

Fishery Barometers.

List of Places supplied with Fishery Barometers.

Shetland Isles.—Balta Sound, Uya Sound, Burravoe, Nesting, Lerwick, Sandsair, Scalloway, Symbister.

Orkney Isles.—Westray, Papa, Burray, Kirkwall.

Scotland, east coast.—Duncansbay, Freswick, Auchengill, Keiss, Ackergill, Staxigoe, Wick, Lybster, Dunbeath, Portmahomack, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy, Whitehills, Gardenstown, Rosehearty, Pitullie, Fraserburgh, Inverallochy, Pointlaw, Findon, Portlethen, Skateraw, Stonehaven, Arbroath, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance, Burntisland, Newhaven.

England, east coast.—Berwick, North Shields, South Shields, Sunderland, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn (2), Wells, Gorleston, Lowestoft, Orford Haven, Woodbridge Haven, Harwich, Brightlingsea, West Mersea, Maldon, Margate, Deal, Kingsdown, Dover.

England, south coast.—Bognor, Ryde, Bembridge, Brixton, Atherfield, Ventnor, Gorey (Jersey), Haslar Hospital, Poole, Weymouth, Portland, Budleigh Salterton, Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscath, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn (2), Mousehole.

England, south-west coast.—St. Ives, Hayle, Port Isaac, Boscastle, Bideford, Burnham, Highbridge, Weston-super-Mare.

Wales.—Briton Ferry, Swansea, Angle, Milford, Aberystwith, Nevin, Carnarvon.

England, north-west coast.—Fleetwood, Morecambe, Maryport.

Isle of Man.—Douglas, Port St. Mary, Peel (2).

Scotland, south-west coast.—Port Patrick, Stranraer.

Ireland, east coast.—Cushendall, Belfast, Bangor, Groomsport, Donaghadee, Ardglass, Warren Point, Carlingford, Greenore, Dundalk, Malahide, Howth, Kingstown (2), Bray, Wicklow.

Ireland, south coast.—Dunmore East, Dungarvan, Crosshaven, Kinsale, Union Hall, Castletownsend, Baltimore, Schull (2), Crookhaven, Castletown (Berehaven), Ballycrovane.

Ireland, west coast.—Valencia, Dingle, Tralee, Tarbert, Kilcredane, Kilronan, Spiddal, Cleggan, Elly Bay, Ballyglass, Ballycastle (Co. Mayo), Donegal, Tribane, Killybegs, Teelin, Malinmore, Portnoo, Burton Port, Kincaslagh, Bunbeg.

Ireland, north coast.—Dunfanaghy, Rathmullen, Buncrana, Malin Head, Moville, Greencastle, Portstewart, Portrush, Ballycastle (Co. Antrim).

Scotland, west coast.—Tarbert (Loch Fyne), Campbeltown, Carradale, Portree, Armadale (Isle of Skye), Plockton, Gruinard, Ullapool, East Mey, Stroma.

Hebrides.—Stornoway, Portnaguiran, Obb, Valtos, Carloway, Ness.

Summary of Stations supplied with Instruments.

England and Wales - - - - -	71
Scotland and Isle of Man - - - -	70
Ireland - - - - - -	57
	198

APPENDIX X.

METHODS FOLLOWED IN DEALING WITH METEOROLOGICAL RETURNS FROM LAND STATIONS IN THE BRITISH ISLES.

These stations are of five classes, as stated on page 16.

I.—*Observatories continuously observing all the Meteorological Elements.*

Returns from observatories.

Hourly measurements of the curves obtained from the self-recording instruments at the observatories of the Office are made by the observers at each station, on printed forms supplied for the purpose, which, together with the curves, are forwarded to the Office weekly. They comprise measurements of the barograms, of the dry bulb and wet-bulb thermograms, of the anemograms, and of the rain-gauge curves.

Examination of returns.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the revised regulations which have been adopted to secure this end will be found in the Report of the Office for 1890. They comprise rules for the guidance of observers, as well as of the assistants charged with the examination of the work at the Office. Attention need be called here to only two of these rules, viz., (*a*) the use of subsidiary sheets on which are entered the results of a second set of measurements of the curves made after, and quite independently of, the first set, and with a different form of scale, the two sets of measurements being afterwards compared together, and any differences found inquired into and set right; and (*b*) the re-measurements of the curve made by the assistants at the Meteorological Office, and which always amount to 40, and in doubtful cases to many more, per month, for each element.

Results of examination and report to Council.

The attention of the observers is always drawn to such errors as may be detected, and to any failures in the continuity of the curves arising from failure of the light, stoppage of the clock, defective photography, faulty action of the wet-bulb thermometer, &c.; a report containing the results of the examination of each Observatory being also submitted to the Council periodically. The curves and tabulations are eventually bound and stored in the Office.

General supervision of observatory work.

In connexion with this work should be mentioned the general watch which has to be kept over the working of the observatories and of the instruments, not only to secure uniformity amongst them and observance of rules, but also to guard against small changes which are liable to occur at certain times, especially with the thermographs, and which may affect the scale-values of the instrument or the datum lines used for the tabulation of the curves. About twice a year this work calls for special examination, entailing some considerable time and occasionally the engraving of new scales for measuring the curves.

METHOD OF DEALING WITH THE NUMERICAL RESULTS FROM THE SELF-RECORDING OBSERVATORIES.

Interpolations.

In dealing with the tabulations the first step is to go over the sheets and fill up by interpolation, wherever possible, any gaps or breaks in the continuity of the record.

The records having been made as complete as possible, are then used for the calculation of daily and hourly mean values, for periods of five days, calendar months, and for the year; which, together with other data obtained from the same source, are published under the title of "Hourly Means of the Readings obtained from the Self-recording "Instruments at the Four Observatories under the Meteorological

"Council." The volume for 1891 is almost ready for issue, and some progress has been made with the calculations for the year 1892. See p. 17.

II.—*Anemographic Stations at which the Wind is recorded continuously.*

The anemograms received from Alnwick Castle, Deerness, Dublin, Fleetwood, Holyhead, North Shields, Scilly, and Yarmouth are regularly examined and tabulated in the Office, and the sheets bound up in volumes. Besides special inquiries on legal and other points that from time to time arise, and in which these documents are of high importance, the tabulations are always employed in the preparation of the various Reports issued by the Office. They are also regularly used in the checking of the Storm Warnings.

III.—*Land Stations of the Second Order.*

Origin and progress of system.

Ever since the year 1866 returns of more or less completeness have been received from land stations in the United Kingdom. In that year there was only one station, but by 1871 the number had increased to 15, and five years later to 49, including 14 stations belonging to the Royal Meteorologieal Society, copies of the returns from which were sent to the Office under a special arrangement with the Society.

At the end of March 1894 the total number of stations was 113, including 15 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society.

It must, however, be observed that while this number is exclusive of the self-recording observatories and of the anemographic stations, it includes several others from which only very scanty information is received.

The stations are distributed as follows: 50 in England, 6 in Wales, 26 in Scotland, and 31 in Ireland.

The methods followed with regard to the examination and publishing of these returns have been fully detailed in previous reports, and need not now be repeated. The changes introduced into the volume for 1886 have been continued in those for later years. These refer to the barometer readings, which are now given at station-level instead of being reduced to the mean sea-level; and to the humidity, where the depression of wet-bulb is shown, the international forms A and B being modified accordingly.

The volume for 1890 contains returns from 68 stations.

Arrangements have been made under which it is hoped that the arrears of this publication will be rapidly reduced.

Reports from the Irish stations are regularly supplied to the Registrar-General for Ireland for his Weekly and Quarterly Returns.

New stations.

When an application for the adoption of a new station is received, a schedule is forwarded to the observer containing a series of questions as to the outfit of the station, the exposure of the instruments, and the influence likely to be exerted on their indications by surrounding objects, such as houses and trees. Only mercurial barometers are accepted, and only such as have been duly verified. All thermometers must have been tested at Kew. A plan of the station, showing the positions of the instruments with regard to neighbouring objects, is also required.

On the return of this schedule the answers are considered, and, where necessary, alterations are advised.

If, however, the existing arrangements are satisfactory, tables for reducing the barometer readings to 32° Fahrenheit at mean sea-level are prepared and duplicates sent to the observer, together with a set of Hygrometrical Tables, and a copy of "Instructions in the Use of Meteorological Instruments."

The first returns are compared and examined with special care, and a report of the result of the examination is forwarded to the observer, with instructions how best to improve and complete the returns.

There are still many parts of the British Islands very poorly represented by the existing stations, and any information for these districts would be valuable.

Sunshine records.

The daily records of sunshine which are now received from 51 Stations in the British Islands are examined generally, to guard against accidental changes in the adjustment of the instruments. Notes explaining any omission or accidental defect are added to the cards if required, and after their receipt has been acknowledged, they are duly stamped and dated and then stored in the Office.

Weekly totals.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VII., and for those stations which are also Stations of the Second Order the monthly totals of bright sunshine in hours, together with the per-centages of its possible duration, are published as Part IV. of "Returns from Stations of the Second Order." A table showing the daily amount of sunshine at Bunhill Row, one of the London stations, is also prepared quarterly for the Royal Meteorological Society.

Inspection.

The Stations of the Second Order are regularly inspected, the attention of the inspector being directed by the Office to any special point which may require investigation.

IV.—*Telegraphic Reporting Stations.*

Full particulars relating to these stations, the information received from them, and the method of dealing with that information, will be found in Appendix VII. to the Report for the year 1888–9. A paragraph in that Appendix (p. 60) explains the use that is made of the monthly schedules sent in by the observers.

V.—*Extra Stations.*

The returns from Stations of the Fifth Class are not regularly published by the Office, but they are available for any special investigation that may be taken up. The rainfall values at these stations are, however, copied and supplied to Mr. Symons, F.R.S., for publication in "British Rainfall."

List of Stations.

In Appendix XI., page 64, is given a complete list of the stations supplying information to the Office.

APPENDIX XI.

LIST of STATIONS in the BRITISH ISLANDS from which INFORMATION has been received at the METEOROLOGICAL OFFICE during the year ending March 31st 1894.

The Stations marked "S" are in connexion with the Scottish Meteorological Society, and those marked "R" are in connexion with the Royal Meteorological Society. The returns from these Stations are received by the Office under an arrangement which will be found detailed in previous reports.

In certain cases where the actual station at which the Observations have been taken is not generally known, and could not be readily identified, the name of some village or town near has been inserted, with the name of the station following within brackets.

The nature of the information received from each station is indicated by letters as follows :—

A. *Observatories.*—Continuous record of pressure, temperature, wind, sunshine and rain, with eye observations of the amount, form, and motion of the clouds, and notes on the weather.

B. *Anemograph Stations.*—Continuous record of the direction and velocity (or force) of the wind.

C. *Barograph Stations.*—Continuous record of pressure.

D. *Second Order Stations.*—Regular observations at 9 a.m. and 9 p.m. each day, local time, of pressure, temperature (dry-bulb and wet-bulb), wind, cloud, and weather, with the daily maxima and minima of temperature, the daily rainfall, and general remarks on the weather.

E. *Second Order Stations.*—Monthly means and summaries on Form B. of observations taken at 9 a m. and 9 p.m , each day as above.

F. *Climatological Stations.*—The maximum and minimum temperature and the rainfall for each day, with remarks on the weather. This information is sent to the Meteorological Office each week for use in the "Weekly Weather Report."

G. *Third Order Stations.*—Observations of the same kind as at Second Order Stations, but either :—

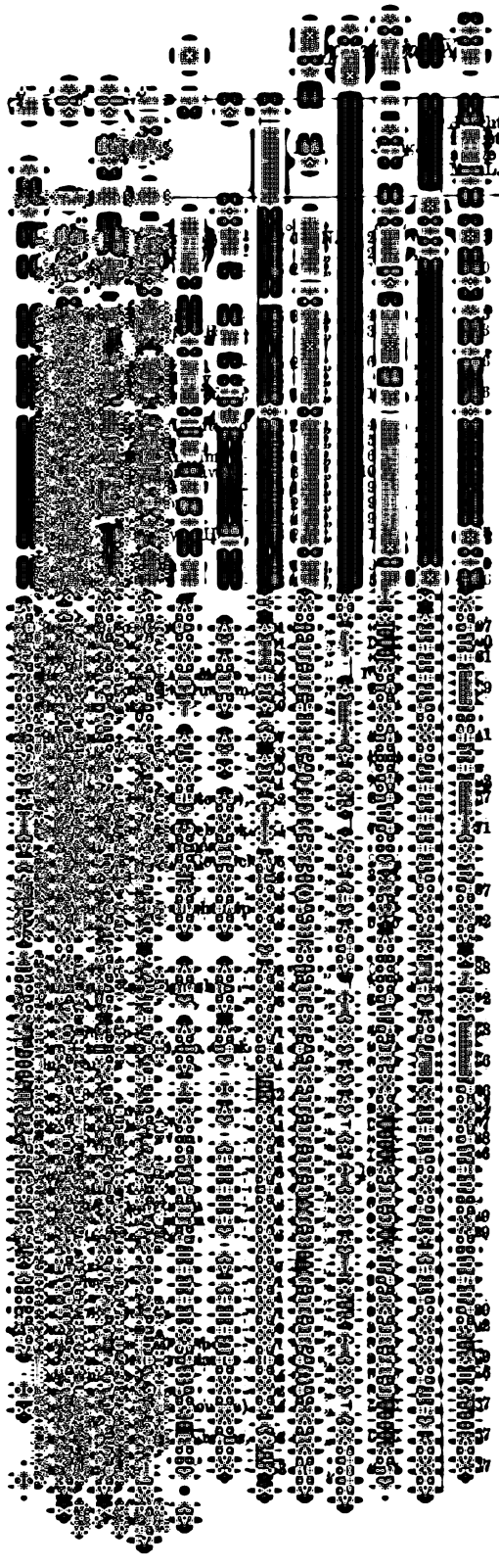
(*a*) less full.
(*b*) taken only once daily.
(*c*) taken at irregular hours.

R. *Rainfall Stations.*—Daily observations of the amount of rainfall, with remarks on the weather.

S. *Sunshine Stations.*—Continuous record of bright sunshine.

T. *Telegraphic Stations.*—Regular observations at 8 a m. and 6 p.m. G.M.T. (and from some stations at 2 p.m. in addition), of pressure, temperature, wind and weather, with the daily maxima and minima of temperature, the daily rainfall, and, where possible, the sea-disturbance at 8 a m. each day and the daily amount of bright sunshine. This information is sent to the Meteorological Office each day by telegraph, for use in the "Daily Weather Report" and, as required, for use in the "Weekly Weather Report."

W. *Sea-temperature.*—Daily observations of the temperature of the sea water.



Observer.	Nature of Information supplied.
Prof. C. Niven	A. T.
Coastguard	W.
Humphry Willyams, for the Duke of Northumberland.	B. F.
J. W. Mayes	T.
W. Stowart, for Lady Chichester.	F.
J. L. E. Dreyer	B.D.F.S.
Coastguard	G. W.
Rev. F. W. Stow	D.
Light-keepers	W.
Coastguard	W.
"	G.
"	W.
"	W.
"	G.
R. Brennan	E.
B. I. Whittaker	F.
Miss M. J. Tolan	T.
R. T. Omond, for Directors Ben Nevis Observatory.	A.
Rev. J. D. Parker	E.
E. Mawley	E.
A. J. Anderson	F. S
Coastguard	W.
W. W. Midgley	G.
Messrs. Primavesi for Town Council.	S.
J. Aitken	D. F. S.
Coastguard	G.
A. Newsholme	S.
J. Harvey Jones	F.
Capt. W. O. Bentley, R.A.	E.
W. Ferguson	D. F.
Coastguard	W.
"	W.
E. J. Sykes	E.
Light-keepers	W.
J. Russell (for John Malcolm of Poltalloch).	E.
P. Morris	T. S.
Light-keepers	W.
P. Dudgeon and A. Peacock.	E.
G. J. Hearder	D.
Coastguard	G.
The Instructor in Surveying.	G.
J. C. Philips	E. F.
E. Tyrer	E.
C. S. Bell	D.
P. Wright	D. F. S.
Prof. Ohm	F. S.
Coastguard	W.
E. Moore	E.
Light-keepers	W.
Prof. H. McLeod	G.
G. Croucher for Sir P. K. Murray, Bt.	E. F.
Coastguard	W.
"	G.
"	G.
John Howe	E.
T. Turner	F. S.
Light-keepers	W.
M. Spence	B. D. S.
T. MacGowan	T.
Captain Evans	E.
A. W. Moore	D. F. S.
F. W. Moore	D.
J. W. Moore	D. F.

	Station.	Lat.		Long.		Height in feet above M.S.L.	Observer.	Nature of Information supplied.
	Dublin (Mountjoy Observatory, Phœnix Park).	53° 22′ N.		6° 21′ W.		155	Lt.-Col. Kirkwood, R.E.	B. D. S.
S	Dundee	56 28	„	2 56	„	160	J. Carnochan	D.
	Dunfanaghy (Sheephaven)	55 11	„	7 58	„	—	Coastguard	W.
	Dungeness	50 55	„	0 59	E.	26	W. Batton	T.
S	Dunrobin Castle	57 59	„	3 56	W.	12	D. Melville, for the Duke of Sutherland.	D.
	Durham	54 46	„	1 35	„	336	H. J. Carpenter	D. F. S.
	Eastbourne	50 46	„	0 17	E.	38	R. Sheward	D. S.
	East Goodwin Lightship	51 13	„	1 36	„	—	Light keepers	W.
	Edgeworthstown (Currygrane).	53 45	„	7 39	W.	267	J. M. Wilson	D. F.
	Edinburgh	55 57	„	3 12	„	253	R. C. Mossman	D. S.
	English and Welsh Grounds Lightship.	51 27	„	3 0	„	—	Light-keepers	W.
	Ennis, Co. Clare	52 51	„	8 59	„	18	J. Hill and P. L. K. Dobbin.	R.
	„ (Roslevan)	52 51	„	8 59	„	40	Mrs. J. W. Scott	R.
	Epsom (Royal Medical College).	51 20	„	0 14	„	294	C. I. Gardiner	D.
	Falmouth	50 9	„	5 4	„	167	E. Kitto	A. F.
	Fleetwood	53 56	„	3 1	„	—	M. S. Gaulter	B.
S	Fort Augustus	57 8	„	4 40	„	68	Rev. M. Wall	B. F. S.
S	Fort William	56 48	„	5 6	„	32	R. T. Omond for Directors, Ben Nevis Observatory.	A. F.
	Foynes, Co. Limerick	52 37	„	9 7	„	166	Lord Monteagle	F.
	Galway	53 17	„	9 3	„	—	Lieut. C. G. F. Law	G.
	Geldeston, Beccles	52 28	„	1 31	E.	37	E. T. Dowson	D. F. S.
	Glasgow	55 53	„	4 18	W.	130	Prof. L. Becker	A. D. F.
S	Glencarron	57 30	„	5 14	„	489	D. D. Munro	E. F.
S	Glenlee	55 5	„	4 12	„	203	W. Melville	E. F.
S	Gordon Castle	57 37	„	3 5	„	101	J. Webster (for the Duke of Richmond and Gordon, K.G.).	E.
	Gorleston, Suffolk	52 35	„	1 43	E.	—	R. J. C. Day	G.
	Guernsey (St. Peter's)	49 32	„	2 32	W.	—	F. E. Carey	S.
	Harpenden, Herts.	51 49	„	0 20	„	419	T. Wilson	G.
	Haslar Hospital, Hants	50 47	„	1 7	„	—	G. Coppen	G.
	Hawes Junction	54 19	„	2 13	„	1135	W. H. Bunce	T.
S	Hereford	52 5	„	2 45	„	274	T. A. Chapman	F.
	Heysham Hall, Lancashire	54 3	„	2 54	„	95	S. Lomas for Miss L. Grafton.	D.
S	Hillington	52 48	„	0 53	E.	88	Rev. H. E. B. Ffolkes	D. F. S.
	Holyhead (Harbour Office)	53 18	„	4 39	W.	—	F. M. Cotton	B. W.
	„ (Sailors' Home)	53 18	„	4 39	„	48	T. Chope	T.
	Hurst Castle	50 42	„	1 33	„	12	E. T. Tremble	T.
	Jersey (St. Aubins)	49 12	„	2 11	„	25	J. Fisher	T.
	„ (St. Heliers)	49 11	„	2 6	„	—	Signal Officer Fort Regent.	S.
	Kearsney Abbey (Dover)	51 8	„	1 17	E.	100?	C. W. Curtis	R.
	Ketton, Stamford	52 39	„	0 33	W.	—	F. Coventry	F. G.
	„ „ (The Holmes)	52 39	„	0 33	„	—		R.
	Kew Observatory	51 28	„	0 19	„	18	C. Chree	A.
	Kilcredane, Co. Clare	52 35	„	9 47	„	—	Coastguard	W.
	Kilkenny	52 39	„	7 14	„	212	H. Carlton, for the Marquis of Ormonde.	C. F.
S	Killarney	52 4	„	9 30	„	86	Ven. Archdeacon Wynne.	B. F.
	Killiney (Cloneevin), Co. Dublin.	53 16	„	6 7	„	—	R. O'Brien Furlong	R.
	Kirkwall	58 59	„	2 57	„	—	Coastguard	W.
	Kish Bank Lightship	53 19	„	5 55	„	—	Light keepers	W.
	Ladylaw (Hawick)	55 28	„	2 47	„	439	W. R. Wilson	C. D.
S	Lairg	58 1	„	4 22	„	335	J. Young	E. F.
	Lamlash, Isle of Arran, Scotland.	55 32	„	5 8	„	—	Coastguard	W.
	Landale, Argyleshire	56 41	„	5 41	„	14	A. Fletcher for T. H. G. Newton.	D. F.
	Laugharne, Carmarthenshire.	51 47	„	4 28	„	15	R. W. Pinney	R.
S	Lednathie	56 45	„	3 7	„	719	W. Morrison (for Stormonth Darling).	E.
	Leith	55 58	„	3 10	„	20	T. Richardson	T.
	Leman and Ower Lightship.	53 8	„	2 2	E.	—	Light-keepers	W.
	Lerwick	60 9	„	1 8	W.	—	Coastguard	W.
S	Lisnan, Co. Tyrone	54 41	„	6 45	„	305	Sir Nathaniel Staples, Bart.	B.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
Liverpool (Bidston Observatory).	53 24 N.	3 ¼ W.	198	W. E. Plummer	D. T.
Liverpool (North-West Lightship).	53 31 „	3 31 „	—	Light-keepers	W.
Llandinam, Montgomeryshire.	52 30 „	3 26 „	498	Edward Davies	R.
Llandovery	51 59 „	3 48 „	217	J. Watkins	F.
Llandudno	53 21 „	3 50 „	88	J. Nicol	E. F. S.
London (Brixton)	51 29 „	0 7 „	77	F. Gaster	T.
„ (City)	51 32 „	0 5 „	80	Messrs. de la Rue	S.
„ (Pall Mall)	51 32 „	0 8 „	—	Athenæum Club	C.
„ (Westminster)	51 31 „	0 8 „	76	The Staff of the Met. Office.	R. S.
Londonderry	55 0 „	7 19 „	67	J. Conroy	D. F.
Loughborough	52 47 „	1 13 „	169	W. Berridge	T.
Lowestoft	52 29 „	1 44 E.	—	J. Andrew	G.
Malin Head, Co. Donegal	55 23 „	7 25 W.	230	O. O'Doherty	T.
Manchester	53 29 „	2 13 „	190	J. Tatham	G. S.
Marchmont	55 44 „	2 25 „	498	P. Loney for Sir H. P. Campbell, Bt.	E. F. S.
Margate	51 24 „	1 24 E.	83	J. Stokes	D. S.
Market Rasen	53 23 „	0 20 W.	83	W. B. Jevons	R.
Markree Castle, Co. Sligo	54 11 „	8 27 „	122	A. Marth for Col. Cooper.	D. F. S.
Minard, Co. Kerry	52 7 „	10 8 „	—	Coastguard	W.
Mold (Penbedw)	53 12 „	3 16 „	650	H. W. Buddiwm	C.
Montrose (Uzon)	56 40 „	2 28 „	—	Coastguard	W.
Morpeth	55 11 „	1 40 „	—	Captain H. Terry	G.
Mount Nugent (Arley Cottage).	53 50 „	7 18 „	262	Major Somerset H. Maxwell.	D. S.
Nairn	57 36 „	3 52 „	84	Miss Penny	T.
Newarp Lightship	52 45 „	1 53 E.	—	Light-keepers	W.
Newport (Ynis-y-bre), Mon.	51 33 „	3 3 W.	115	F. W. Houghton	R.
Newquay, Cornwall	50 25 „	5 5 „	—	J. Pearce	S.
„ „	50 25 „	5 5 „	—	Coastguard	W.
Northallerton	54 20 „	1 26 „	130	W. Stead	R.
North Foreland	51 23 „	1 27 E.	115	A. Cox	T.
Omagh (Edenfel)	54 36 „	7 19 W.	300	Col. Buchanan	F.
Oswaldkirk, Yorks.	54 12 „	1 3 „	—	R. Thompson	S.
Outer Dowsing Lightship	53 27 „	1 5 E.	—	Light-keepers	W
Owers Lightship	50 39 „	0 41 W.	—	„	W
Oxford	51 46 „	1 16 „	208	W. Wickham for E. J. Stone.	T. S.
Parkstone, Dorset	50 43 „	1 56 „	197	R. H. Barnes	D.
Parsonstown (Birr Castle)	53 6 „	7 55 „	175	O. Boeddicker, for Earl of Rosse.	D. S. T.
Pembroke (St. Ann's Head).	51 41 „	5 11 „	150	H. T. Knott	T. S. W.
Pennant Bay, Aberdour	57 40 „	2 16 „	—	Coastguard	W.
Pinmore (Girvan)	55 12 „	4 49 „	187	P. Donald for Capt. Hamilton.	E.
Plymouth	50 22 „	4 8 „	116	H. V. Prigg	D. F. S.
Portrush	55 13 „	6 40 „	—	Coastguard	W.
Prawle Point	50 12 „	3 43 „	332	M. Holmes	T.
Prestwich	53 33 „	2 17 „	294	T. R. H. Clunn	D. F. S.
Roche's Point, Cork	51 47 „	8 19 „	42	W. Kennedy	T.
Rosewell	55 51 „	3 7 „	690	R. W. D. Cameron	E.
Rothamsted	51 48 „	0 22 „	368	Sir J. B. Lawes and Sir J. H. Gilbert.	F. S.
Rothesay	55 50 „	5 4 „	116	J. Kay	E.
Rounton, Northallerton	54 24 „	1 18 „	240	Sir I. L. Bell, Bart.	E.
Rousdon, Devon	50 42 „	3 0 „	523	C. E. Peek	E.
Roxborough, Co. Limerick	52 39 „	8 56 „	—	A. W. Shaw	R.
Royal Sovereign Lightship.	50 43 „	0 27 E.	—	Light-keepers	W.
Rugby	52 22 „	1 15 W.	379	H. P. Highton	G.
St. David's	51 53 „	5 16 „	215	W. P. Propert	D.
St. Helen's, Lancashire	53 28 „	2 45 „	151	J. Robertson	G.
St. Leonards	50 51 „	0 33 E.	129	H. Colburne	D. F. S.
Salcombe, Kingsbridge	50 14 „	3 46 W.	—	Coastguard	W.
Sandgate, Kent	51 4 „	1 9 E.	—	H. E. Stilgoe	R.
Scarborough	54 17 „	0 23 W.	159	Dr. H. G. H. Monk	D. F.
„	54 17 „	0 23 „	—	Coastguard	W.
„	54 17 „	0 23 „	—	„	G.
Schull	51 32 „	9 32 „	—	A. Hicks	B.S.T.W.
Scilly Islands (St. Mary's)	49 56 „	6 18 „	80	Coastguard	W.
Seafield (Co. Clare)	52 46 „	9 30 „	—	G. H. Aird	D.
Seaham	54 50 „	1 19 „	148	H. C. Malan	R.
Sedbergh	54 19 „	2 32 „	400	Light-keepers	W.
Seven Stones Lightship	50 4 „	6 5 „	—	Light-keepers	W.
Shambles Lightship	50 31 „	2 20 „	—	„	W.
Sheffield	53 23 „	1 29 „	429	E. Howarth	D.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
Sherborne (Stowell), Dorset.	50 57 N.	2 31 W.	376	Rev. H. J. Poole	F.
Shields, North	55 0 „	1 27 „	97	J. W. Irvine	T.
Shields, North, Old Lighthouse.	55 0 „	1 27 „	—	Captain Harrison	R.
Shipwash Lightship	52 2 „	1 38 E.	—	Light-keepers	W.
Solway Lightship	54 48 „	3 32 W.	—	Light-keepers	W.
Southampton	50 55 „	1 24 „	78	J. T. Cook for Dir. Gen. of Ordnance Survey.	D.F.S.
South Rock Lightship	54 25 „	5 22 „	—	Light keepers	W.
Spidall, Co. Galway	53 15 „	9 17 „	—	Coastguard	G.
Spurn Head	53 34 „	0 7 „	19	G. Freeman	T.
Spurn Lightship	53 34 „	0 13 E.	—	Light-keepers	W.
Stokesay, Craven Arms	52 26 „	2 52 W.	370	Miss M. A. Digges La Touche.	D.
Stonyhurst College	53 51 „	2 28 „	375	Rev. W. Sidgreaves	A.D.F.
Stornoway	58 11 „	6 22 „	28	J. Forbes	T.S.
„	58 11 „	6 23 „	—	Coastguard	W.
Stranraer	54 54 „	5 2 „	—	Patrick Doran	G.
Strathfield Turgiss, Hants	51 20 „	1 0 „	196	Rev. C. H. Griffith	F.
Sumburgh Head (Dunrossness).	59 51 „	1 17 „	126	Rev. W. Brand	T.
Sunderland	54 54 „	1 23 „	—	Coastguard	W.
Sutton Coldfield	52 34 „	1 49 „	392	C. F. Marston	S.
Symbister, Shetlands	60 14 „	1 25 „	—	J. S. Nicolson	G.
Tarbert, Harris	57 53 „	6 47 „	—	D. Bethune	G.
Tealby, Lincolnshire	53 24 „	0 16 „	251	Rev. S. Lewin	D.
Teelin, Donegal	54 38 „	8 39 „	—	Coastguard	W.
Tenby	51 41 „	4 42 „	79	J. E. Gower	S.
Thurcaston, Leicester	52 42 „	1 10 „	263	Rev. T. A. Preston	S.
Torquay	50 28 „	3 31 „	—	A. Chandler	S.
Totland Bay, Isle of Wight	50 41 „	1 35 „	84	J. Dover	G.
Union Hall, Co. Cork	51 33 „	9 8 „	—	Coastguard	G.
Uppingham	52 35 „	0 44 „	484	Rev. G. H. Mullins	D.
Valencia Observatory, Cahirciveen.	51 56 „	10 15 „	90	J. E. Cullum	A. T.
„ Island (Glanleam)	51 55 „	10 20 „	—	Miss E. FitzGerald	R.
„ (Knightstown)	51 55 „	10 20 „	—	Coastguard	G.
Wakefield	53 41 „	1 30 „	96	H. Clarke	R.
Waterford (Brook Lodge)	52 15 „	7 6 „	104	C. P. Bolton	C. F.
Waterford	52 15 „	7 8 „	—	Harbour Authorities	C.
Westbourne, Sussex	50 52 „	0 55 „	—	Rev. L. B. Birkett	S.
Westray, Orkney	59 17 „	3 0 „	—	J. Hewison	G.
Wick	58 27 „	3 6 „	80	J. Sinclair	T.
Wick	58 27 „	3 6 „	—	Coastguard	W.
Wolfelee	55 23 „	2 39 „	567	W. Cockburn	D.
Worksop	53 18 „	1 8 „	—	H. Mellish	S.
Yarmouth	52 37 „	1 43 E.	10	G. T. Watson	B. T.
York (Boothgate)	53 57 „	1 5 W.	—	J. E. Clark	S.
„ (The Museum)	53 57 „	1 5 „	51	H. M. Platnauer	D. T.

In addition to the above, reports are received daily from the following Continental Stations.

Station.	Authority.	Station.	Authority.
Haparanda	Meteorological Office, Sweden.	†The Helder	Bureau Central Météorologique, Paris.
Hernösand		Cape Gris Nez	
†Stockholm		†Brest (St. Mathieu)	
Wisby		Lorient (Ile de Groix)	
Bodö	Meteorological Institute, Norway.	*†Rochefort (Ile d' Aix)	
†Christiansund		†Biarritz	
*†Skudesnes		†Paris	
Færder		Belfort	
		Lyons	
		Nice	
		Perpignan	
†The Scaw	Meteorological Institute, Denmark.	Berlin	Cent. Met. Inst. of Germany.
Fanö		Wiesbaden	
Cuxhaven	Deutsche Seewarte, Hamburg.	Munich	
		Coruuna	Observatory, Lisbon.
		†Lisbon	

Note.—The stations marked with an asterisk (*) report also at 2h. p.m., and those with dagger (†) at 6h. p.m.; Lisbon reports at 4h. p.m. instead of 6h. p.m.
The Helder does not send reports at 6 p.m. on Sundays.

APPENDIX XII.

Accessions to the Library during the Year ending 31st March 1894.

Accra.—Meteorological observations recorded at theAccra Observatory. By J. F. Easmon. 1891, Jan.–1892, Dec. la. f°. Sheets.

Adelaide Observatory.—Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the Northern Territory, during the years 1884–87, under the direction of C. Todd. 2 vols. sm. f°. Adelaide, 1893.

[———] Rainfall in South Australia and the Northern Territory during 1892; with weather characteristics of each month. By C. Todd. sm. f°. Adelaide, 1893.

Aitken, John.—On the colour of the Mediterranean and other waters. 8°. (*Proc. R. Soc. Edinb.*, xi., 1881–82, *p.* 472.)

‖ ——— On some observations made without a dust counter on the hazing effect of atmospheric dust. 8°. (*Proc. R. Soc. Edinb.*, xx., 1893, *p.* 76.)

‖ ——— Breath figures. 8°. (*Proc. R. Soc. Edinb.*, xx., 1893, *p.* 94.)

——— On the number of dust particles in the atmosphere of certain places in Great Britain and on the Continent, with remarks on the relation between the amount of dust and meteorological phenomena. Part ii. la. 4°. Edinburgh, 1892. (*Trans. R. Soc. Edinb.*, xxxvii., *Part* i., *p.* 17.)

‖ ——— On the particles in fogs and clouds. la. 4°. Edinburgh, 1893. (*Trans. R. Soc. Edinb.*, xxxvii., 1893, *p.* 413.)

Åkerblom, P.—De l'emploi des photogrammètres pour mesurer la hauteur des nuages. la. 8°. Upsala, 1894.

[Algiers, Service Météorologique du Gouvernement Général de l'Algérie.]—Bulletin météorologique de l'Algérie. 1893, Jan. 1–Dec. 31. sm. f°. Sheets.

[Allahabad, Meteorological Office.]—Brief sketch of the meteorology of the North-Western Provinces and Oudh and adjacent parts of Rajputana and the Panjab for the year 1892. sm. f°. s.l.e.a.

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.—Nomina geographica Neerlandica. Geschiedkundig onderzoek der nederlandsche aardrijkskundige namen, . . . iii^de^ Deel. la. 8°. Leiden, 1893.

——— ——— Tijdschrift . . . onder redactie van C. M. Kan en J. Æ. C. A. Timmerman. Tweede serie. Deel x. 2 vols. 8°. Leiden, 1893.

Antigua, Government Laboratory. — Meteorological register for 1893. By F. Watts. (Suppl. to the Leeward Islands Gazette, 8th Feb. 1894.) la. 8°.

* ‖ **Arctic dispatches (The),** containing an account of the discovery of the North-West Passage by Capt. R. Maclure, commanding H.M.S. "Investigator." With a narrative of proceedings of H.M.S. "Resolute," Capt. Kellett, C.B., and the dispatches of Capt. Sir Edward Belcher, C.B., Capt. Inglefield, and Commr. Pullen. 8°. London, s.a. (*Naut. Mag.*, 2*nd ser.*, xxii., 1853, *pp.* 577 *and* 617.)

* ——— **Sea.**—Letters written during the late voyage of discovery in the Western Arctic Sea. By an Officer of the Expedition. 8°. London, 1821. (*Voyages, Vol. V., published by Sir R. Phillips & Co.*)

Atmósfera, La.—Revista mensual . . . publicada por el Observatorio de Vilafranca del Panadés. Año i., 1892. 8°. Año ii., 1893. sm. f°. 2 vols. Vilafranca del Panadés, s.a.

L'Atmosphère.—Recueil de documents météorologiques publié par les soins de l'Observatoire de la Tour Saint-Jacques à Paris. la. 8°. Paris, 1893.

Nota.—Books marked * have been acquired by purchase; the others are donations from institutions, societies, or authors. Those marked ‖ are excerpt papers, extra copies of which have been separately printed.

In some cases additional publications have been received besides those specified, but only completed volumes or years are given here.

* **August, E. F.** — Psychrometertafeln nach den neuesten Untersuchungen berechnet von E. F. August. sm. 8°. Berlin, 1848.

* **Babinet, [J.]**—Études et lectures sur les sciences d'observation et leurs applications pratiques. Vols. i.–viii. 8 vols., sm. 8°. Paris, 1855–68.

* **Baily, W.**—On an integrating anemometer. Read Dec. 8, 1883. 8°. (*Phil. Mag., ser.* 5, xvii., 1884, *p.* 482.)

(Barber, C. A.)—Rainfall returns, 1892—Dominica and Montserrat. la. 8°. (*Suppl. Leeward Islands Gazette, July* 6, 1893.)

Bárcena, M.—El clima de la Ciudad de México. 8°. México, 1893.

Batavia, Magnetical and Meteorological Observatory.—Observations . . . Published . . . under the direction of J. P. Van der Stok. Vol. xv., 1892. f°. Batavia, 1893.

[——— **Observatorium.**]—Regenwaarnemingen in Nederlandsch—Indië. xiv. Jaarg. 1892. 8°. Batavia, 1893.

Title and Preface in the English language also.

Bathurst, Gambia.—Comparative rainfall in the Colony of the Gambia. 1887–1891. sm. f°. Sheet.

——— Meteorological statistics. 1892. Slip.

Baxendell, J.—Abstracts of observations at the Southport meteorological observatory for the weeks ending Dec. 31, 1892 to Dec. 29, 1893. Slips.

‖ **Bayard, F. C.**—The direction of the wind over the British Isles. 1876–80. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xix., 1893, *p.* 172.)

Belize.—Summary of meteorological observations at St. Joseph's Observatory during the months of Jan.—Dec. 1893. 4°. Sheets. (*The Angelus, Belize*, 1893–94.)

Ben Nevis.—Guide to Ben Nevis, with an account of the foundation and work of the meteorological observatory. sm. 8°. Edinburgh and Glasgow. s.a.

‖ ——— Meteorological observations on Ben Nevis. Report of the Committee . . . Drawn up by Dr. Buchan. 8°. (*Rep. Br. Assoc. Adv. Sc.*, 1893.)

Benson, C.—An account of the normal distribution of the rainfall in the Madras Presidency, based on the records of twenty years. sm. f°. Madras, 1892.

Berlin, Deutsche Meteorologische Gesellschaft.—Berliner Zweigverein der deutschen meteorologischen Gesellschaft. 8.10.11. Vereinsjahr, 1886, 1893, 1894. 3 vols. 8°. Berlin, 1886, 1893, 1894.

——— **Königlich Preussisches Meteorologisches Institut.**—Bericht über die Thätigkeit . . . von W. v. Bezold. 1891, 1892. 2 vols. la. 8°. Berlin, 1893.

——— ——— Ergebnisse der meteorologischen Beobachtungen im Jahre 1890. la. 4°. Berlin, 1893.

——— ——— Ergebnisse der Niederschlags-Beobachtungen im Jahre 1891. la. 4°. Berlin, 1893.

‖ ——— ——— Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1893, Jan.–Dec. la. 4°. (*Statist. Korresp.*)

* **Bert, P.**—La pression barométrique. Recherches de physiologie expérimentale. la. 8°. Paris, 1878.

Bibliothèque Universelle [et Revue Suisse]. Archives des sciences physiques et naturelles. Troisième période. Tomes xxix.–xxx. 2 vols. 8°. Genève, 1893.

‖ **Bidwell, S.**—Fogs, clouds and lightning. 8°. [*Proc. R. Inst. Great Britain*, 1893, *May.*]

Birkenhead. Meteorological results. 1892. 8° (*Rep. on San. condition of Birkenhead for* 1892, *by R. S. Marsden, p.* 11.)

* **Blasius, W.**—Stürme und moderne Meteorologie. Vier Vorträge gehalten in Braunschweig. 1891–92. la. 8°. Braunschweig, 1893.

* **Blink, H.**—Wind- und Meeresströmungen im Gebiet der kleinen Sunda Inseln. la. 8°. (*Beitr. z. Geophys., Abhandl. geogr. Seminar. Univ. Strassburg, I. p.* 1, *Stuttgart*, 1887.)

‖ **Boedl, W.**—Die Schneedecke in Bayern im Winter 1891–92. 4°. (*Beob. meteor. Stat. K. Bayern*, xiv., 1892.)

Bombay, Government Observatory.—Magnetical and meteorological observations made at the Government Observatory, Bombay, in the years 1891 and 1892, under the direction of C. Chambers and C. Chambers, jun., together with an appendix containing an account of a magnetic research. f°. Bombay, 1893.

(——— ———) Report on the condition and proceedings of the Government Observatory, Colába, for the year which ended with the 30th June 1893. f°. s.l.e.a.

[Bombay Meteorological Office.]—Brief sketch of the meteorology of the Bombay Presidency in 1892–93. f°. s.l.e.a.

‖ **Boston, Mass., Weather Bureau.**—Annual summary of the New England Weather Service for the year 1892. la. 4°. Cambridge, Mass., 1893. (*Ann. Astr. Obs. Harvard Coll.*, xli., *Part* i.)

——— Bulletin of the New England Weather Service. 1893, Jan.–Dec. 4°. s.l.e.a.

Bougainville, [L. A.] de.—The History of a voyage to the Malouine (or Falkland) Islands, made in 1763 and 1764.

See PERNETTY, A. J.

Bremen, Meteorologische Station I. Ordnung. — Deutsches meteorologisches Jahrbuch für 1892. Ergebnisse der meteorologischen Beobachtungen. Herausgegeben von P. Bergholz. Jahrg. iii. la. 4°. Bremen, 1893.

Brisbane, Post and Telegraph Department, Meteorological Branch.—Brisbane Observatory, Wickham Terrace. Meteorological synopsis. Jan.–Dec., 1891–1892. f°. Sheets. (*Suppl. Queensland Gov. Gazette*, 1891–93.)

——— ——— Table of rainfall. 1890. Jan.–Dec. f°. Sheets.

British North Borneo Herald and Official Gazette. Vol. xi. 1893. Nos. 1–12. f°. Sandakan, 1893.

Contains meteorological observations.

* **(Bruce, E. S.)** Town fogs: their amelioration and prevention. 8°. (*Dublin Rev., cxiv.*, 1894, *Jan.*, *p.* 132).

Brussels, Observatoire Royal.—Bulletin météorologique. 1893, Jan. 1–Dec. 31. f°. Sheets.

‖ **Buchan, [A.]** The temperature of London for 130 years, from 1763 to 1892. la. 8°. (*Journ. Scott. Meteor. Soc.*, *3rd ser.*, ix., *p.* 213.)

‖ ——— ——— The temperature of the North-east of Scotland for 129 years from 1764 to 1892. la. 8°. (*Journ. Scott. Meteor. Soc.*, *3rd ser.*, *ix.*, *p.* 224.)

Bucharest, Institutut Meteorologic al Romaniei.—Analele . . de S. C. Hepites. Tom. vi.–vii., 1890–1891. 2 vols. la. 4°. Bucuresti, 1893.

In the French language also.

Cairo, Ministère de l'Intérieur. Administration des Services Sanitaires et d'Hygiène Publique.—Bulletin hebdomadaire. 8me année, 1893 Nos. 1–52. Suppl. au Journ. Officiel, 1893–94. la. 4°.

[Calcutta, Meteorological Office, Bengal.]—Bay of Bengal weather chart. 1893, Jan. 1–Dec. 31. sm. f°. Sheets.

——— ——— Bengal daily weather report. 1893. sm. f°. Sheets.

These reports are only published during the rainy season.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the weeks ending January 7 to December 30, 1893. f°.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the months of January to December 1893, with annual tables. sm. f°.

——— ——— Meteorological summary for the monsoon period of 1893. sm. f°. s.l.e.a.

(——— ———) Summary of the meteorology of Bengal for the year 1892. sm. f°. s.l.e.a.

——— **Meteorological Office, India.**—Abstract of the results of meteorological observations taken at the Alipore Observatory in the months of Jan.–Dec. 1893. sm. f°. Sheets.

——— ——— Abstract of the results of the barometric and thermometric observations taken at the Meteorological Office, Chowringhee. 1893, Jan.–Dec. sm. f°. Sheets.

[**Calcutta, Meteorological Office, India.**]—Cyclone memoirs, No. V. Account of three cyclones in the Bay of Bengal and Arabian Sea during the month of November 1891, viz., the Port Blair cyclone of 1st to 7th, the Minicoy cyclone of 1st to 3rd, and the cyclone of 19th to 25rd. By J. Eliot. la 8°. Calcutta, 1893.

——— ——— India daily weather report. 1893. Jan. 1–Dec. 31. f°. Sheets.

——— ——— Indian meteorological memoirs. Vol. iv. sm. f°. Calcutta, 1886–93.

[——— ———] The India weather review for the year 1892. f°. Calcutta, 1893.

[——— ———] Memorandum on the snowfall in the mountain districts bordering Northern India and the abnormal features of the weather in India during the past five months, with a forecast of the probable character of the south-west monsoon rains of 1893. f°. (Simla, 1893.)

[——— ———] Meteorological observations recorded at seven stations in India in the year 1892, corrected and reduced. f°. Calcutta, 1893.

[——— ———] Rainfall of India, 1891, 1892. 2 vols. sm. f°. s.l.e.a. and Calcutta, 1893.

1891 has no title page.

(——— ———) Report on the administration of the Meteorological Department of the Government of India in 1892–93. f°. s.l.e.a.

——— ——— Results of the meteorological observations taken at the Alipore Observatory, from Jan. 1 to Dec. 30, 1893. sm. f°. Sheets.

——— ——— Results of the barometrical and thermometrical observations taken at the Meteorological Office, Chowringhee, from 1st January to 30th December 1893. sm. f°. Sheets.

‖ **Calvori, P.**—Andamento della pioggia in Pesaro nel ventennio 1871–90, con altri dati meteorologici dedotti dal settennio d'osservazioni 1876–82. la. 8°. Pesaro, 1891. (*Ann. Istituto Tecn.*)

Cambridge Philosophical Society.—Transactions. Vols. xiii.–xv. 3 vols. la. 4°. Cambridge, 1883, 1889, 1894.

Cambridge (Mass.), Astronomical Observatory of Harvard College.—Annals. Vol. xix., Part ii. Researches on the zodiacal light and on a photographic determination of the atmospheric absorption. la. 4°. Cambridge, 1893.

——— ——— Annals. Vol. xxxi. Part ii. Investigations of the New England Meteorological Society for the year 1891. la. 4°. Cambridge, Mass., 1893.

——— ——— Annals. Vol. xi. Part ii. Observations made at the Blue Hill meteorological observatory, Mass., U.S.A., in the year 1892. Under the direction of A. L. Rotch. la. 4°. Cambridge, 1893.

Cape Town, Meteorological Commission, Cape of Good Hope.—Report of the Meteorological Commission for the year 1892. sm. f°. Cape Town, 1893.

Carlsruhe, Centralbureau für Meteorologie und Hydrographie.—Deutsches meteorologisches Jahrbuch für 1892. Grossherzogthum Baden. Die Ergebnisse der meteorologischen Beobachtungen im Jahre 1892. Bearbeitet von C. Schultheiss, zugleich ii. Theil des Jahresb. . . . . für 1892. la. 4°. Karlsruhe, 1893.

——— ——— Jahresbericht . . . mit den Ergebnissen der meteorologischen Beobachtungen und der Wasserstandsaufzeichnungen am Rhein und an seinen grössern Nebenflüssen für das Jahr, 1892. la. 4°. Karlsruhe, 1892.

——— ——— Uebersicht der Ergebnisse der an den badischen meteorologischen Stationen angestellten Beobachtungen, nebst Wasserstandsaufzeichnungen an den wichtigsten Hauptpegeln des Rheins. 1893. Jan.-Dec. f°. Sheets.

* **Cassell & Co.**—The Universal Atlas. Published for the Atlas Publishing Co., Lim., by Cassell & Co., Lim. f°. London, 1893.

‖ **Chandler, A.**—The climate of Torquay. 8°. (*Trans. Devon. Assoc. Adv. Sc.*, xxv., 1893, *p.* 271.)

Chemnitz, K. Sächsisches meteorologisches Institut. — Deutsches meteorologisches Jahrbuch für 1892. Beobachtungssystem des Königreiches Sachsen. la. 4°. Chemnitz, 1893.

——— ——— Wetterbericht. 1892, Jan. 1–Dec. 31. oblong 8°.

[——— ———] Wetterbericht. 1893, Jan.-Dec. la. 4°. (*Wissensch. Beil. der Leipziger Zeitung*, 1893–94.)

Chevalier, S.—The "Bokhara" typhoon, October 1892. Read before the Shanghai Meteor. Soc. 8°. Shanghai, 1893.

——— Typhons de 1892, Juillet, Août, Septembre. la. 8°. Shanghai, 1894.

Christiania, Den Norske Nordhavs-Expedition, 1876–1878. — Bind i.–vi. 6 vols. f°. [Christiania, 1880–1893.]

In the English language also.

|| ——— **Norsk Meteorologisk Institut.**—Nedbør-høiden i Norge, beregnet efter observationer 1867 til 1891 af Det meteorologiske institut. la. 4°. (*Norsk Teknisk Tidsskr.*)

——— **Norwegisches Meteorologisches Institut.**—Jahrbuch, 1891. sm f°. Christiania, 1893.

* **Ciel et Terre.**—Revue populaire d'astronomie, de météorologie, et de physique du globe. xiv^e^ année; 1893–94. 8°. Bruxelles, s.a.

Clark, J. E.—[Letter addressed to Yorks. Phil. Soc. as to warnings of floods.] 4°. Dated, York, 1893.

|| ——— Notes on York meteorology for 1892. la. 8°. (*Rep. Yorks. Phil. Soc.*, 1892, *p.* 33.)

|| **Clayton, H. H.**—Six and seven day weather periodicities. la. 8°. (*Amer. Meteor. Journ.*, x., 1893, *p.* 35.)

|| (———) Six and seven day weather periods. la. 8°. (*Amer. Meteor. Journ.* x., 1893, *p.* 322.)

|| ——— Six and seven day weather periods. la. 8°. (*Amer. Journ. Sc.*, *3rd ser.*, xlvii., 1894, *p.* 228.)

|| ——— The movements of the air at all heights in cyclones and anti-cyclones, as shown by the cloud and wind records at Blue Hill. la. 8°. (*Amer. Meteor. Journ.*, x., 1893, *p.* 170.)

Clements, H.—Hugh Clements' weather almanack, 1893. f°. Sheet.

[———] Clements' weather calendar for 1894. Containing forecasts of the weather for every day in the year. la. f°. Sheet. London, [1893].

Coimbra, Observatorio Meteorologico e Magnetico da Universidade.—Observações meteorologicas e magneticas . . . 1892. f°. Coimbra, 1893.

|| **Colombo, Surveyor General's Office.**—Report on the meteorology of Ceylon for 1892. sm. f°. (*Ceylon Administr. Rep.*, 1892, *Part* ii., *p.* B 1.)

|| ——— ——— Results of meteorological observations in Ceylon during the months of January to December 1892. f°. Sheets. (*Suppl. Ceylon Gov. Gazette*, 1892–93.)

——— ——— Return of rainfall in Ceylon during 1892, and the means during different periods. la. f°. Sheet.

Cook, James.—An Account of a voyage round the world in the years 1768–1771.

See HAWKESWORTH, J.—An account of the voyages . . . in the southern hemisphere.

See also WHARTON, W. J. L.

* ——— A voyage towards the South Pole, and round the world. Performed in His Majesty's ships the Resolution and Adventure, in the years 1772–1775. Written by James Cook, Commander of the Resolution. In which is included Capt. Furneaux's narrative of his proceedings in the Adventure during the separation of the ships. Vols. i.–ii. 2 vols., 4°. London, 1777.

* ——— **and King, James.**—A voyage to the Pacific Ocean, Undertaken, by the command of His Majesty, for making discoveries in the northern hemisphere . . . . Performed under the direction of Captains Cook, Clerke, and Gore, in His Majesty's ships the Resolution and Discovery, in the years 1776–1780 Vols. i.–iii. and Atlas. Vols. i. and ii. written by Capt. James Cook. Vol. iii. by Capt. James King. 3 vols. 4°. 1 vol. la. f°. London, 1784.

Copenhagen, Dansk Meteorologisk Institut.—Bulletin météorologique du Nord, publié par les Instituts météorologiques de Norvége, de Danemark et de Suède. Année 1893. oblong 8°. Copenhague, s.a.

——— ——— Maanedsoversigt over Vejrforholdene. 1893, Jan.—Dec. f°.

——— ——— Meteorologisk Aarbog. 1890. f°. Kjøbenhavn, 1891.

In the French language also.

Copenhagen, Institut Météorologique de Danemark.—Annales de l'Observatoire Magnétique de Copenhague publiées par A. Paulsen. Année 1892. sm. f°. Copenhague, 1893.

——— ——— Observations internationales polaires, 1882–83. Expédition Danoise. Observations faites à Godthaab. Tome I. Livr. i. sm. f°. Copenhague, 1893.

——— **Kongelige Danske Videnskabernes Selskab.**—Oversigt over det . . . . Forhandlinger og dets Medlemmers Arbejder i Aaret 1892. la. 8°. Kjøbenhavn, 1892–93.

* ——— **und Hamburg, Dänisches Meteorologisches Institut und Deutsche Seewarte.**—Tägliche synoptische Wetterkarten für den nordatlantischen Ozean und die anliegenden Theile der Kontinente. viii. Jahrg., 1–4 Quart., Dec. 1888–Nov. 1889. 4 vols. f°. Copenhague et Hambourg, 1893.

In the French language also.

‖ **Cracow, C. K. Akademii Umiejętności w Krakowie.**—Materyały do klimatografii Galicyi zebrane przez sekcyę meteorologiczną komisyi fizyograficznej . . . 1892. la. 8°. Kraków, 1893. (*Odbitek ze Sprawozd. Kom. fizyogr.*)

——— **K. K. Sternwarte in Krakau.**—Meteorologische Beobachtungen. 1893. la. 8°. Krakau, 1893.

Croydon Microscopical and Natural History Club.—[Daily rainfall at stations in Kent and Surrey.] 1893. Jan.–Dec. 4°. Sheets.

‖ ——— Report of the Meteorological Sub-Committee for 1892. 8°. [*Proc. and Trans. Croydon Microsc. Nat. Hist. Club*, 1893, *p.* 28.]

‖ **Cyprus.**—Meteorological observations. 1892. sm. f°. [*Cyprus Blue Book.*]

Davis, W. M.—Elementary meteorology. la. 8°. Boston, U.S.A., 1894.

‖ ——— The general winds of the Atlantic Ocean. la. 8°. (*Amer. Meteor. Journ.*, 1893, *Mch.*, *p.* 476.)

‖ ——— The winds of the Indian Ocean. Read before the New Engl. Meteor. Soc. in Boston, Oct. 21, 1893. la. 8°. (*Amer. Meteor. Journ.*, 1893, *Dec.*, *p.* 333.)

‖ ——— William Ferrel. la. 8°. (*Proc. Amer. Acad. Arts and Sc.*, xxviii. *p.* 388.)

Davos.—Davoser Wetterkarte. Nach dem Schema von Herrn C. Wetzel, Ingenieur, herausgegeben im Auftrag des Curvereins Davos-Platz vom Amtl. Beobachter der Schweiz. meteor. Station Davos. 1893. Jan.–Dec. la. f°. Sheets.

In the French and English languages also.

[Dehra Dun, Surveyor General of India.]—General report on the operations of the Survey of India Department . . . during 1891–92. sm. f°. Calcutta, 1893.

Dewar, D.—Atmospheric tendencies, mean velocity and probable weather, 1894. sm. 4°. Dalkeith, [1893.]

——— Explanatory notes on the system of weather forecasting. 8°. Dalkeith, 1894.

* **Dickson, H. N.**—Meteorology. The elements of weather and climate. sm. 8°. London, 1893.

* ——— On sunshine. la. 8°. (*Scott. Geogr. Mag.*, ix., 1893, *Aug.*, *p.* 393.)

Dove, K.—Ueber meteorologische und verwandte Beobachtungen in Südwestafrika. 8°. (Berlin, s.a.)

Dublin, General Register Office.—Quarterly returns of the marriages, births, and deaths registered in . . . Ireland; . . . 1893. 1st–4th quarters, Nos. 117–120. la. 8°. Dublin, 1893–94.

——— ——— Weekly returns of births and deaths in Dublin (including its suburban districts), and in fifteen of the principal urban sanitary districts in Ireland, 1893. la. 8°. Dublin, 1894.

* ——— **Royal Irish Academy.**—Instructions for making meteorological and tidal observations. 8°. Dublin, 1850.

——— ——— Proceedings. Third series. Vol. ii. 8°. Dublin, 1891–93.

* **Dubois, E.**—Die Klimate der geologischen Vergangenheit und ihre Beziehung zur Entwickelungsgeschichte der Sonne. 8°. Nijmegen u. Leipzig, 1893.

‖ **Dufour, C.**—La scintillation des étoiles. 8°. (*Arch. Sc. Phys. et Nat.*, 3e *période*, xxix., 1893, *p.* 545.)

Easmon, J. F.—Meteorological observations at Accra.
See ACCRA.

Eastbourne.—Annual report of meteorological observations for the year 1893. s. 8°. Eastbourne, s.a.

[Eberswalde, Hauptstation des forstlichen Versuchswesen in Preussen.]—Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von A. Müttrich. Neunzehnter Jahrg. 1893, Jan.–Dec. 8°. Berlin, 1893.

[——— ———] Jahresbericht über die Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von Dr. A. Müttrich. xviii. Jahrg., 1892. 8°. Berlin, 1892.

Edinburgh, Royal Society.—Proceedings. Vol. xix. 1891–92. 8°. Edinburgh, 1893.

* **Egede, H.**—A description of Greenland. Translated from the Danish. sm. 8°. London, 1745.

‖ **Ekholm, N.**—Om psykrometerformeln, särskildt vid låga lufttryck. 8°. (*Öfversigt K. Vet.—Akad. Förhandl.*, 1894, *p.* 3.)

‖ ———, **und Arrhenius, S.**—Ueber den Einfluss des Mondes auf den elektrischen Zustand der Erde. Mitgetheilt den 13 Dec. 1893. 8°. Stockholm, 1894. (*K. Svenska Vet.—Akad. Handl.* xix., *Afd.* 1, No. 8.)

* **Ellis, D.**—An inquiry into the changes induced on atmospheric air, by the germination of seeds, the vegetation of plants, and the respiration of animals. 8°. Edinburgh, 1807.

* ——— Farther inquiries, &c. 8°. Edinburgh, 1811.

[——— **W.**] Map [of England and Wales] showing lines of equal magnetic declination for January 1, 1894. (*Supplement to the "Colliery Guardian," Jan.* 5, 1894.) f°. Sheet.

Emden, Naturforschende Gesellschaft.—Jahresbericht. 77. 1891–92. 8°. Emden, 1893.

Erk, F.—Dr. C. Lang. (Nachruf.) la. 4°. (*Beilage zur Allgemein. Zeitung*, 1893, *Oct.* 17.)

‖ ——— Eine wissenschaftliche Fahrt mit zwei Ballons am 11 Juli 1892. la. 4°. (*Beob. meteor. Station. K. Bayern*, xiv., 1892.)

* **Erskine, J. E.**—Journal of a cruise among the islands of the Western Pacific, including the Feejees and others inhabited by the Polynesian negro races, in Her Majesty's ship Havannah. 8°. London, 1853.

* **Exner, F.**—Über unsere Atmosphäre. Vorträge des Ver. Verbr. naturw. Kenntn. Wien. xxxi. Jahrg., Heft. 3. sm. 8°. Wien, 1891.

Falmouth, Royal Cornwall Polytechnic Society.—Annual report. 60th. 1892. 8°. Falmouth, s.a.

Figee, S.—Uitkomsten van meteorologische waarnemingen in Nederlandsch-Indië gedurende de maanden Januari–Juni van het jaar 1891. la. 8°. (*Natuurk. Tijdschr. Nederl. Ind.*, li., *p.* 125.)

Finley, J. P.—Certain climatic features of the two Dakotas, illustrated with one hundred and sixty-three tables, charts, and diagrams. la. 4°. Washington, 1893.

Fiume, K. K. Marine-Akademie.—Meteorologische Beobachtungen. 1893. Jan.–Dec., and Results. la. 8°. Sheets.

Formosa.—Report by Mr. Hosie on the Island of Formosa, with special reference to its resources and trade. Parl. Paper. sm. f°. London, 1893.

‖ **Fox, W. L.**—Meteorological tables for Falmouth and the Scilly Islands, for the year 1892. . . . 8°. (*Ann. Rep. R. Cornw. Polyt. Soc.*, 1892.)

Frankfurt am Main, Physikalischer Verein.—Jahresbericht . . . für das Rechnungsjahr 1891–92. 8°. Frankfurt am Main, 1893.

Fritsche, H.—Die magnetische Localabweichungen bei Moskau und ihre Beziehungen zur dortigen Local-Attraction. la. 8°. (*Bull Soc. imp. Nat. Moscow*, 1893, *No.* 4.)

|| **Garrigou-Lagrange, P.**—Sur la prévision du temps et sur l'enchaînement des situations atmosphériques. la. 8°. Limoges, 1893. (*Le Gay-Lussac.*)

|| **Gaster, F.**—Suggestions, from a practical point of view, for a new classification of cloud forms. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xix., 1893, *p.* 218.)

Geneva, Société de Géographie.—Le Globe. Journal géographique. Tome xxxii. la. 8°. Genève, 1893.

Georgetown, Demerara, Government Botanist's Office.—Report on the Botanic Gardens and their work, for the year 1891–92, sm. f°. Georgetown, 1893.

* **Gerland, G.**—Beiträge zur Geophysik. Zeitschrift für physikalische Erdkunde. II. Bd. Heft 1. la. 8°. Stuttgart, 1894.

* **Glaisher, J.**—Hygrometrical tables adapted to the use of the dry and wet bulb thermometer. 7th ed. la. 8°. London, 1885.

|| **Grablovitz, G.**—Sulle osservazioni mareografiche in Italia e specialmente su quelle fatte ad Ischia. la. 8°. Genova, 1893. (*Atti Congr. Geogr. Ital., Genova*, 1892.)

|| **Gratzl, A.**—Schwerebestimmungen im hohen Norden. Ausgeführt vom A. Gratzl im Sommer, 1892. 8°. Wien, 1893. (*Mittheil. k. u. k. milit.-geogr. Inst.*, xii., 1892.)

Greenwich, Royal Observatory.—Report of the Astronomer Royal to the Board of Visitors, 1893. la. 4°. s.l.e.a.

——— ——— Results of the magnetical and meteorological observations made at the Royal Observatory, Greenwich, in the year 1890; under the direction of W. H. M. Christie. la. 4°. London, 1892.

Greenwood, W. N.—Greenwood's nautical almanac, general and coasting kludonometric tide tables . . . . 1894. sm. 4°. Lancaster, s.a.

——— ——— Tides and tidal phenomena considered in connection with atmospheric pressure. Read before the Shipmasters' Society, London, 18th Jan. 1894. 8°. London, 1894.

Grenada, Richmond Hill Observatory.—Meteorological report. By J. M. Lash. 1893, Jan.–Dec. sm. f°. Sheets.

* **Guilhon, E.**—Théories météorologiques et prévision du temps. la. 8°. Paris, 1894.

Halle, Kaiserliche Leopoldino-Carolinische Deutsche Akademie der Naturforscher.—Leopoldina. Heft xxviii., 1892. la. 4°. Halle, 1892.

Hamburg, Deutsche Seewarte.—Annalen der Hydrographie und maritimen Meteorologie. xxi. Jahrg., 1893. la. 8°. Berlin, s.a.

——— ——— Aus dem Archiv der Deutschen Seewarte. xv.–xvi., Jahrg., 1892–1893. 2 vols. la. 4°. Hamburg, 1893–94.

——— ——— Deutsches meteorologisches Jahrbuch für 1892. Beobachtungs-System der Deutschen Seewarte. Ergebnisse der meteorologischen Beobachtungen . . . Jahrg. xv. sm. f°. Hamburg, 1893.

——— ——— Deutsche ueberseeische meteorologische Beobachtungen. Heft. vi. sm. f°. s.l.e.a.

——— ——— Resultate meteorologischer Beobachtungen von Deutschen und Holländischen Schiffen für Eingradfelder des nordatlantischen Ozeans. Quadrate 77, 150. Nos. xi.–xii. 2 vols. la. 4°. Hamburg, 1893.

——— ——— Vierteljahrs-Wetter-Rundschau an der Hand der täglichen synoptischen Wetterkarten für den nordatlantischen Ocean des Dänischen meteorologischen Instituts und der Deutschen Seewarte. Bd. v. 1887–88. la. 8°. Berlin, 1893.

——— ——— Wetterbericht. Jahrg. xviii. 1893, Jan. 1.–Dec. 31. f°. Sheets.

Hancock, E. A.—Meteorological record for St. Kitts.
See St. Kitts.

|| **Hann, J.**—Beiträge zum täglichen Gange der meteorologischen Elemente in den höheren Luftschichten. la. 8°. (*Sitzungsb. k. Akad. Wissensch. Wien, math. naturw. Cl., Bd.* ciii., *Abth.* ii., 1894, *p.* 51.)

|| ——— Beiträge zum täglichen Gange der meteorologischen Elemente in den höheren Luftschichten. la. 8°. (*K. Akad. Wissensch. Wien. Sitz. math. naturw. Cl.* 4 *Jan.* 1894. *Sonderabdruck aus dem akad. Anzeiger Nr.* 1.)

|| **Hann, J.**—Der tägliche Gang der Temperatur auf dem Obirgipfel (2140 m.) und einige Folgerungen aus demselben. la. 8°. Wien, 1893. (*Sitzungsb. k. Akad. Wissensch. Wien, math. naturw. Cl.*, cii., *Abth.* ii., 1893, *p.* 709.)

|| ——— Die neue Anemometer- und Temperatur-Station auf dem Obirgipfel (2140 m.). la. 8°. (*Meteor. Zeitschr.*, 1893, *Aug.*, *p.* 281.)

|| ——— Die neue Wetterwarte auf dem Obirgipfel und einige Ergebnisse der Registrierung der Lufttemperatur an derselben im Jahre 1892. la. 8°. (*Carinthia*, ii., *Nr.* 3, 1893.)

|| ——— Einige Resultate der anemometrischen Aufzeichnungen in Wien, 1873–1892. la. 8°. (*Sitzungsb. k. Akad. Wissensch. Wien, math. naturw. Cl.*, *Bd.* cii., *Abth.* ii., 1893, *p.* 119.)

|| ——— Meteorological stations and the publication of results of observations. la. 8°. [*Rep. Internat. Meteor. Congr., Chicago, Aug.* 1893, *Part* i., *p.* 1.]

|| ——— Über das Klima von Quito. 8°. (*Zeitschr. Gesellsch. Erdk. Berlin*, xxviii., 1893, *p.* 107.)

|| (———) Unterschied zwischen dem täglichen Gang des Barometers auf dem Ben Nevis an nebligen Tagen und klaren Tagen. sm. f°. (*Meteor. Zeitschr.*, 1894, *Marz*, p. 99.)

Hardie, D.—Notes on some of the more common diseases in Queensland in relation to atmospheric conditions. 1887–1891. With vol. of charts. 2 vols. 8°. Brisbane, 1893.

|| **Harding, C.**—The great storm of November 16th–20th, 1893. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xx., 1894, *p.* 43.)

* **Harris, W. S.**—The meteorology of thunderstorms, with a history of the effects of lightning on two hundred and ten ships of the British Navy, as recorded in the official journals of the respective ships. 8°. [London], 1844.

|| **Hartl, H.**—Vergleiche von Quecksilber-Barometern mit Siede-Thermometern. la. 8°. Wien, 1893. (*Mittheil. k. u. k. milit. geogr. Inst.*, xii., 1892.)

Havana, Real Colegio de Belen de la Compañia de Jesus en la Habana.—Observaciones magnéticas y meteorológicas, 1889. f°. Habana, 1893.

* **Hawkesworth, J.**—An account of the voyages undertaken by the order of His present Majesty for making discoveries in the southern hemisphere, and successively performed by Commodore Byron, Captain Wallis, Captain Carteret, and Captain Cook, in the Dolphin, the Swallow, and the Endeavour: drawn up from the journals which were kept by the several Commanders, and from the papers of Joseph Banks, Esq., by John Hawkesworth. 1764–1771. Vols. i.–iii. 3 vols. 4°. London, 1773.

Heineken, N. S.—Climate of Sidmouth, Jan. 1868–Oct. 1878 (except Aug. 1870). Slips.

See also RADFORD, W. T.

* **Hellmann, G.**—Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus herausgegeben von G. Hellmann. No. 1. L. Reynman. Wetterbüchlein von wahrer Erkenntniss des Wetters. 1510. Facsimiledruck mit einer Einleitung. 4°. Berlin, 1893.

* ——— ——— No. 2. Blaise Pascal. Récit de la grande expérience de l'équilibre des liqueurs. Paris, 1648. Facsimiledruck mit einer Einleitung. 4°. Berlin, 1893.

* ——— ——— No. 3. Luke Howard. On the modifications of clouds. London, 1803. 4°. Berlin, 1894.

——— Schneekrystalle. Beobachtungen und Studien von G. Hellmann. Mit elf Abbildungen im Text und acht Tafeln in Heliogravüre und Lichtdruck nach mikrophotographischen Aufnahmen von R. Neuhauss. la. 8°. Berlin, 1893.

|| **Hensele, J. A.**—Untersuchungen über den Einfluss des Windes auf den Boden. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg*, xvi., *Heft* 3, 4.)

|| **Hepites, S. C.**—Observations pluviométriques en Roumanie pour l'année 1891. la. 4°. Bucarest, 1893. (*Anal. Inst. Meteor. Roumain.*, vii., 1891.)

In the Roumanian language also.

|| **Hepites, S. C.**—Notice historique sur l'Institut météorologique de Roumanie. la. 4°. (*Anal. Inst. Meteor. Rouman.*, vii., 1891, *p. B.* 4.)

In the Roumanian language also.

|| ——— Le climat de Sulina d'après les observations météorologiques de 1876 à 1890. la. 4°. (*Anal. Inst. Meteor. Rouman.*, vii., 1891, *p. B.* 31.

In the Roumanian language also.

|| ——— La pluie en Roumanie. la. 4°. (*Anal. Inst. Meteor. Rouman.*, vii., 1891, *p. B.* 84.)

In the Roumanian language also.

|| ———La pluie en Roumanie en 1891. la. 4°. (*Anal. Inst. Meteor. Rouman.*, vii., 1891, *p. B.* 111.)

——— Le verglas du 11 et du 12 novembre 1893. la. 4°. (*Anal. Inst. Meteor. Rouman.*, vii., 1891, *p. B.* 119.)

* **Herschel, Sir J. F. W.**—Familiar lectures on scientific subjects. sm. 8°. London, 1867.

Hildebrandsson, H. H., et Hagström, K. L.—Des principales méthodes employées pour observer et mesurer les nuages. la. 8°. Upsala, 1893.

* || **Hilgard, E. W.**—Ueber den Einfluss des Klimas auf die Bildung und Zusammensetzung des Bodens. 8°. Heidelberg, 1893. (*Forschungen auf dem Geb. Agrik. phys.*)

* **Himmel und Erde.**—Illustrirte naturwissenschaftliche Monatsschrift. Herausgegeben von der Gesellschaft Urania zu Berlin. Redacteur: M. W. Meyer. v. Jahrg. la. 8°. Berlin, 1893.

Hobart, Royal Society of Tasmania.—Papers and proceedings . . . for 1892. 8°. Hobart, 1893.

Hong-Kong, Botanic Gardens.—Report on the effects of the late frosts [January 1893] on vegetation. With six photo. views. sm. f°. Dated, February, 1893.

——— **Observatory.**—Observations and researches. 1892. f°. Hong-Kong, 1893.

* **Hooker, W. J.**—Journal of a tour in Iceland, in the summer of 1809. Second edition, with additions. Vols. i. and ii. 2 vols. 8°. London, 1813.

|| **Horn, F.**—Die Gewitterforschung an der Kgl. bayerischen meteorologischen Centralstation seit dem Jahre 1879. la. 4°. (*Beob. meteor. Stat. K. Bayern*, xiv., 1892.)

Hosie, A.—Report on the Island of Formosa.

See Formosa.

* **Howard, L.**—On the modifications of clouds. London, 1803.

See Hellmann, G.—Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus. No. 3.

Internationale Meteorologen-Conferenzen. — Zusammenstellung der Beschlüsse.

See Wild, H.

* **Inwards, R.**—Weather lore. A collection of proverbs, sayings, and rules concerning the weather. la. 8°. London, 1893.

Ithaca, New York State Weather Bureau.—Report. Vol. v., 1893, Jan.–Dec. la. 4°. s.l.e.a.

For Jan. to Mch. the title is "Report of the New York Weather Service."

Jamaica.—Jamaica rainfall for the year 1892. f°. Dated, Kingston, 1893.

No. 158 of "Jamaica Weather Report."

|| ——— Weather report for the months of Jan.–Dec. 1893. sm. f°. Kingston, 1893–94. (*From the Jamaica Gazette.*)

* **Jamin, J.**—Cours de physique de l'Ecole Polytechnique. 4e édition, augmentée et entièrement refondue par M. Jamin et M. Bouty. Tome ii., 1er–3e Fasc.; iii., 3e Fasc.; iv., 2e partie, 4e Fasc. 5 vols., 8°. Paris, 1885–1891.

Hagenmeyer, A.—Résumé météorologique de l'année 1892 pour Genève et le Grand Saint-Bernard. 8°. Genève, 1893. (*Arch. Sc. Phys. Nat.*, 1893, *Août et Sept.*)

Karlinski, [F.]—Stan Wody na rzekach Galicyjskich oraz opad atmosferyczny . . . . . 1891, 1892. 2 vols. 8°. Lwów, 1892–93.

Keate, G.—An account of the Pelew Islands, situated in the western part of the Pacific Ocean. Composed from the journals and communications of Captain Henry Wilson, and some of his officers, who, in August 1783, were there shipwrecked, in the Antelope, a packet belonging to the Honourable East India Company. Second edition. 1a. 4°. London, 1788.

|| Kew Observatory.—Report of the Kew Committee for the year ending December 31, 1892. 8°. London, 1893. (*Proc. R. Soc.*, liii., 1893, *p.* 322.)

Kiel, Ministerial-Kommission zur Untersuchung der Deutschen Meere.—Ergebnisse der Beobachtungsstationen an den deutschen Küsten über die physikalischen Eigenschaften der Ostsee und Nordsee und die Fischerei. Jahrg. 1892. Heft i.–xii. Oblong 8°. Berlin, 1893.

——— Sechster Bericht der Kommission zur wissenschaftlichen Untersuchung der deutschen Meere, in Kiel für die Jahre 1887 bis 1891. xvii. bis xxi. Jahrg. f°. Berlin, 1893.

* King, James.—A voyage to the Pacific Ocean . . . . in the years 1776–1780.

See Cook, James, and King, James.

* Klein, H. J.—Jahrbuch der Astronomie und Geophysik. iv. Jahrg., 1893. 8°. Leipzig, 1894.

Klossovsky, A.—Une page de l'histoire du réseau météorologique privé du sud-ouest de la Russie. 1a. 4°. Odessa, 1893.

——— Le climat d'Odessa d'après les observations de l'Observatoire Météorologique de l'Université Impériale d'Odessa. 1a. 4°. Odessa, 1893.
Text in Russian language.

|| Knipping, E.—Die tropischen Orkane der Südsee zwischen Australien und den Paumotu Inseln. 4°. Hamburg, 1893. (*Archiv. Deutsch. Seewarte*, xvi., 1893, *No.* 1.)

Krasno, agrarmeteorologisches Observatorium des Neutrathaler landwirtschaftlichen Vereines.—Der Laubfrosch. v.–vi. Jahrg., 1892–1893. ix.–x. Jahrg. der populären meteor. Abhandlungen . . . Redigirt durch Frh. G. Friesenhof. 1a. 4°. Alt-Krasno, 1892–93.

——— agrarmeteorologisches Observatorium zu Alt-Krasno (vordem Nedanócz.)—Monatsberichte 1892 über die regelmässigen Beobachtungen. Jan.–Dez. 1a. 4°. Alt-Krasno, 1893.

——— agrarmeteorologisches Observatorium des Neutrathaler landwirtschaftlichen Vereines.—Wetterkalender für Ungarn. 1893. Jahrg. x. Nos. 1–21. sm. 4°. Sheets.

Lagos, Colonial Surgeon.—Meteorological observations taken at Lagos. 1893, Jan.–Dec. f°. Sheets. (*Gov. Gazette*, 1893.)

La Guardia, Observatorio Meteorológico del Colegio de la Compañia de Jesús.—1°. Un estudio sobre las borrascas en la costa occidental de Galicia. 2°. Las observaciones meteorológicas del año 1891. 8°. Tuy, 1893.

Lahore, Meteorological Reporter to Government, Punjab.—Summary of meteorological conditions prevailing over the Punjab. 1893. Jan.–Dec. f°. Sheets.

——— Sanitary Commissioner.—Report on the Sanitary Administration of the Punjab for the year 1892. f°. Lahore, 1893.

|| (Lang, C.)—Bericht über die Thätigkeit der kgl. bayerischen meteorologischen Centralstation und der ihr angeschlossenen Stationen im Jahre 1892. 4°. (*Beob. meteor. Stat. K. Bayern*, xiv., 1892.)

|| ——— Durchschnittliche Häufigkeit und Wahrscheinlichkeit des Niederschlages in Bayern. 4°. (*Beob. meteor. Stat. K. Bayern*, xiv., 1892.)

Lash, J. M.—Meteorological report.

See Grenada, Richmond Hill Observatory.

* **Lauder, Sir T. D.**—An account of the great floods of August 1829, in the province of Moray, and adjoining districts. Second edition. 8°. Edinburgh, 1830.

Leslie, A.—The voyage of the Vega round Asia and Europe.
See NORDENSKIÖLD, A. E.

|| **Leyst, E.**—Untersuchungen über den täglichen und jährlichen Gang der meteorologischen Elemente an den Cyclonen- und Anticyclonentagen. sm. f°. St. Petersburg, 1893. (*Repert. Meteor.*, xvi., *No.* 8.)

Lisbon, Observatorio Do Infante D. Luiz.—Boletim meteorologico. 1893, Jan. 1–Dec. 31. f°. Sheets.

* || **Lloyd, H.**—On the mean results of observations. Read June 12, 1848. la. 4°. Dublin, 1849. (*Trans. R. Irish Acad.*, xxii., *Part* 1.)

Lloyd's Seaman's Almanac.—1894. 8°. London, [1893].

* **Lommel, E.**—Lexikon der Physik und Meteorologie in volkstümlicher Darstellung. sm. 8°. Leipzig, 1882.

London, Admiralty.—Tide tables for the British and Irish Ports, for the year 1894; also the times and heights of high water at full and change for the principal places on the Globe. la. 8°. London, s.a.

(—— —— **Hydrographic Office.**)—Admiralty manual for the deviations of the compass. Originally edited in 1862 by F. J. Evans and A. Smith. 6th edition. la. 8°. London, 1893.

—— —— —— Africa Pilot, or sailing directions for the West Coast of Africa, Part ii. 4th ed. la. 8°. London, 1893.

—— —— —— Catalogue of Admiralty charts, plans, and sailing directions, 1894. la. 8°. London, s.a.

—— —— —— The Channel Pilot. Part i. South coast of England. 8th edition. la. 8°. London, 1893.

—— —— —— Eastern Archipelago, Part ii., Western Part, comprising the South-East Coast of Sumatra, Java, the Islands East of Java, the South and East Coasts of Borneo, and Celebes Island. Compiled . . . by Rear-Adm. J. P. Maclear. la. 8°. London, 1893.

—— —— —— The Irish Coast Pilot. 4th ed. la. 8°. London, 1893.

—— —— —— Notes bearing on the navigation of H.M. Ships. Fourth edition. la. 8°. London, 1893.

—— —— —— The Pacific Islands Pilot. Vol. i., Part 2. Western Groups, comprising New Caledonia and the Loyalty Islands. Also supplementary information respecting the New Hebrides, Banks, Torres, and Santa Cruz Groups. la. 8°. London, 1893.

—— —— —— Sailing directions for Dardanelles, Sea of Marmora, Bosporus, and Black Sea. 4th ed., 1893. la. 8°. London, 1893.

—— —— —— The South America Pilot. Part i. 4th edition. la. 8°. London, 1893.

—— —— —— The West India Pilot. Vol i. From Cape Orange in Brazil to Cape Sable in Florida, with the adjacent islands. 5th edition. la. 8°. London, 1893.

London, Board of Trade.—Abstracts of the returns made to the Board of Trade of shipping casualties . . . from the 1st July 1891 to the 30th June 1892 . . . with charts and appendices. sm. f°. London, 1893.

—— **Edinburgh, and Dublin Philosophical Magazine** and Journal of Science. Fifth series. Vols. xxxv.–xxxvi., 1893. 2 vols. 8°. London, s.a.

—— **General Register Office.**—Annual report of the Registrar-General of births, deaths, and marriages in England. 1853, 1855, 1880. 16th, 18th, 43rd. 3 vols. la. 8°. London, 1856, 1857, 1882.

—— —— Annual summary of births, deaths, and causes of death in London and other large cities. 1865, 1870, 1876–1883. 10 vols. la. 8°. London, 1866, 1871, 1877–84.

—— —— Weekly return of births and deaths in London. Vols. xx.–xxi., 1859–60. 2 vols. la. 8°. London, 1859–60.

—— —— Weekly return of births, and deaths in London and . . . other great towns. Vol. liv., 1893. la. 8°. London, 1893.

—— —— Quarterly return of marriages, births, and deaths registered in . . . England, Nos. 177–180, 1893. la. 8°. London, 1893–94.

London, Meteorological Office.—Daily weather report. 1893, Jan. 1–Dec. 31. 2 vols. la. 4°. s.l.e.a.

——— ——— Hourly means of the readings obtained from the self-recording instruments at the four observatories under the Meteorological Council. 1890. la. 4°. London, 1893.

——— ——— Meteorological observations at stations of the second order for the year 1889. la. 4°. London, 1893.

——— ——— Report of the Meteorological Council to the Royal Society, for the year ending 31st of March 1893. la. 8°. London, 1893.

——— ——— The weekly weather report of the Meteorological Office for the years 1892 and 1893 (vols. ix.–x., 3rd series), containing synoptic charts, and descriptive summaries of the weather for each day; also tabular summaries of temperature, rainfall, and bright sunshine for each week, with monthly supplements and two appendices. 2 vols. la. 4°. London, 1893–94.

* ——— **Royal Geographical Society.**—Journal. Vols. i.–xxi. 1831–51. 21 vols. 8°. London, 1832–1851. Vols. i. and iii. are 2nd ed.

——— ——— The geographical journal. Including the proceedings of the Royal Geographical Society. Vols. i.–ii., 1893. 2 vols. la. 8°. London, 1893.

——— **Royal Institution of Great Britain.**—Notices of the proceedings at the meetings of the members . . . with abstracts of the discourses delivered at the evening meetings. Vol. xiii., 1890–92. 8°. London, 1893.

——— **Royal Meteorological Society.**—The meteorological record. Monthly results of observations made at the stations of the R. Meteor. Soc., with remarks on the weather for the year 1892. By W. Marriott. Vol. xii. la. 8°. London, 1893.

Contains also "Meteorology of England during the quarters ending March to December 1892." By J. Glaisher.

——— ——— Quarterly Journal. Vol. xix., 1893. la. 8°. London, 1893.

——— **Royal Society.** — Proceedings. Vols. lii.–liv. 1892–93. 3 vols. 8°. London, 1892–94.

——— **Society of Arts.** — Journal. Vol. xii., 1892–93. la. 8°. London, 1893.

|| **Lovering, J.**—On the secular periodicity of the aurora borealis. Communicated, October 11th, 1859. la. 4°. [*Mem. Amer. Acad. Arts Sc.*, ix., *p.* 101.]

|| ——— Catalogue of auroras observed, mostly at Cambridge [Mass.], after the year 1838. la. 4°. (*Mem. Amer. Acad. Arts Sc., New ser.*, x., *Part* i., 1868, *p.* 1.)

|| ——— On the periodicity of the aurora borealis. Communicated, December 6, 1864. la. 4°. (*Mem. Amer. Acad. Arts Sc., New Ser.*, x., *Part* i., 1868, *p.* 9.)

Lyons, C. J.—Rainfall for 1890. [Hawaiian Islands.] sm. 8°. Slip.

(———) Report of assistant in charge of meteorology. [Hawaiian Islands.] 8°. Honolulu, 1890.

(———) Weather record for Honolulu and the Hawaiian Islands, 1892. 8°. [Honolulu], 1893.

——— **and Barton, G. H.**—Meteorological report for the months of January to June 1883. (Observations taken for the Hawaiian Government Survey.) Slips.

|| **Macfarlane, A.**—On rainmaking. Read Dec. 31, 1892. la. 8°. (*Trans. Texas Acad. Sc.*, *p.* 72.)

* **M'Cormick, R.**—Voyages of discovery in the Arctic and Antarctic Seas, and round the world; being personal narratives of attempts to reach the North and South Poles; and of an open boat expedition up the Wellington Channel in search of Sir John Franklin and Her Majesty's ships "Erebus" and "Terror," in Her Majesty's boat "Forlorn Hope," under the command of the author. 2 vols. la. 8°. London, 1884.

McLandsborough, J., and Preston, A. E.—Meteorology of Bradford for 1893. f°. Sheet.

Madras Observatory.—Hourly meteorological observations made at the Madras Observatory from January 1856 to February 1861. la. 4°. Madras, 1893.

Madrid, Instituto Central Meteorológico.—Boletin. 1 March to 31 Dec. 1893. sm. f°.

——— **Observatorio.**—Resumen de las observaciones meteorológicas efectuadas en la Peninsula y algunas de sus islas adyacentes durante el año de 1890. 8°. Madrid, 1893.

——— ——— Treinta años de observaciones meteorológicas. Exposición y resumen de las efectuadas en el Observatorio de Madrid desde el 1° de Enero de 1860 al 31 de Diciembre de 1889. Oblong 8°. Madrid, 1893.

Manchester Literary and Philosophical Society.—Memoirs and proceedings. 4th series. Vol. vii. 8°. Manchester, 1893.

——— **Public Health Office.**—Quarterly return of the Medical Officer of Health. 1893. la. 8°. Manchester, s.a.

——— ——— Weekly return of the Medical Officer of Health. 1893. la. 8°. Manchester, s.a.

——— **Sheffield, and Lincolnshire Railway.**—Monthly statement of rain fallen in the year ending 31st December, 1893. la. 4°. Sheet.

Manila, Observatorio Meteorológico.—El magnetismo terrestre en Filipinas por el P. Ricardo Cirera. la. 4°. Manila, 1893.

——— ——— Observaciones. 1891. sm. f°. Manila, 1891.

Margate, Medical Officer of Health.—Annual report . . . also the meteorological report for the year 1892. 8°. Margate [1893.]

Marseilles, Commission de Météorologie du Département des Bouches-du-Rhone.—Bulletin annuel. Année 1892. 11^me^ année. 4°. Marseille, 1893.

Mauritius, Royal Alfred Observatory.—Annual report . . . for the year 1891 and 1892. 2 vols. sm. f°. s.l.e.a.

‖ ——— ——— Results of meteorological observations taken during the year 1892, at the Royal Alfred Observatory, Mauritius. sm. f°. (*Mauritius Blue Book*, 1892.)

(Mellish, H.)—The weather of 1893, at Hodsock Priory, Worksop. 8°. s.l.e.a.

‖ **Merrifield, F.**—The colouring of chrysophanus phlœas as affected by temperature. 8°. (*Entomologist*, 1893, *Dec.*)

* **Meares, J.**—Voyages made in the years 1788 and 1789, from China to the North-West Coast of America; with an introductory narrative of a voyage performed in 1786, from Bengal, in the ship "Nootka." To which are annexed observations on the probable existence of a North-West passage, and some account of the trade between the North-West coast of America and China; and the latter country and Great Britain. 2 vols. 8°. London, 1791.

Melbourne Observatory.—Monthly record of results of observations in meteorology, terrestrial magnetism, &c., &c., taken at the Melbourne Observatory, together with abstracts from meteorological observations obtained at various localities in Victoria. 1892, Jan.–June. la. 8°. Melbourne, s.a.

Continued quarterly as "Record of results of observations, &c."

——— Record of results of observations in meteorology and terrestrial magnetism made at the Melbourne Observatory, and at other localities in the Colony of Victoria, Australia. 1892, July–Dec. la. 8°. Melbourne, 1893.

This is continuation of "Monthly record of results, &c."

Mell, P. H.—Report on climatology of the cotton plant.

See Washington, Department of Agriculture, Weather Bureau.

Meteorologische Zeitschrift.—Herausgegeben im Auftrage der Oesterreichischen Gesellschaft für Meteorologie und der Deutschen Meteorologischen Gesellschaft. x. Jahrg. (xxviii. Bd. d. Zeitschr. oesterr. Gesellsch. Meteor.) 1893. la. 8°. Wien, s.a.

Mexico.—General summary of the meteorological observations taken in several localities of the United States of Mexico. Oblong la. 8°. Sheet.

——— **Central Meteorological Observatory.**—Meteorological summary of 16 years. 1877–92. [For each year.] Oblong sm. f°. Sheet.

——— ——— Summary of 16 years observations. 1877–92. [For each month.] Oblong f°. Sheet.

Mexico, Ministerio de Fomento de la Republica Mexicana.—Boletin. Tomo x. [? xi.] Nos. 110–146. 1886, Jan.–May. f°. México, 1886.

——— **Sociedad Cientifica "Antonio Alzate."**—Memorias. Tomo vi. 1892–93. 8°. México, 1892.

Milan, R. Osservatorio Astronomico di Brera in Milano.—Osservazioni meteorologiche eseguite nell' anno 1893, col riassunto composto sulle medesime da E. Pini. sm. f°. s.l.e.a.

‖ **Mitchell, J. C.**—The weather at Chester during the first ten months of 1893 8°. (*Proc. Chester Soc. Nat. Sc. and Lit.*, 1893, *p.* 275.)

‖ **Mohn, H.**—Irisirende Wolken. sm. f°. (*Meteor. Zeitschr.* 1893, *März.*, *p.* 81.)

Mohorovičić, A.—Der Tornado bei Novska. Vorgelegt in der Sitz. der Südslav. Akad. Wissensch. und Künste vom 22 April, 1893. la. 8°. Agram, 1894.

* **Mont Blanc, Observatoire Météorologique.**—Annales . . . publiées sous la direction de J. Vallot. I. 4°. Paris, 1893.

Moore, W. U.—Further report on the bore of the Tsien-Tang-Kiang. 1892. Published by . . . . the Admiralty. la. 8°. London, 1893.

Morandi, L.—La lluvia en el clima de Montevideo. la. 8°. Montevideo, 1893.

Munich.—Rapport de la conférence météorologique internationale. Réunion de Munich, 1891. [Publié par le] Bureau Central Météorologique de France. la. 8° Paris, 1893.

——— **K. [b.] meteorologische Centralstation.** — Beobachtungen der meteorologischen Stationen im Königreich Bayern . . . xiv. Jahrg., 1892. sm. f°. München, 1893.

‖ ——— ——— Uebersicht über die Witterungsverhältnisse im Königreiche Bayern. 1893, Jan.–Dec. la. f°. Sheets. (*Separat-Abdruck aus der "Augsburger-Abendzeitung."*)

——— ——— Wetterkarte und Wetterbericht. 1893, Jan. 1–Dec. 31. Oblong f°. Sheets.

* **Nansen, F.**—The first crossing of Greenland. Translated from the Norwegian by H. M. Gepp. 2 vols., 8°. London, 1890.

* **Nature.**—A weekly illustrated journal of science. Vols. xlvii.–xlviii. 1892–93, 2 vols. la. 8°. London and New York, s.a.

* **Nature, La.**—Revue des sciences et de leurs applications aux arts et à l'industrie. Journal hebdomadaire illustré. xxi^{e} année, 1893. 1er et 2^{e} Semestres. 2 vols. sm. f°. Paris, s.a.

Nautical Magazine and Journal of the Royal Naval Reserve. Enlarged series. Vol. lxii., 1893. la. 8°. London, s.a.

New York, American Geographical Society.—Journal. Vol. xxv., 1893. la. 8°. New York, s.a.

——— **Meteorological Observatory.**—Report. 1892–93. 2 vols. 4°. New York, 1892–93.

Nice, Société de Médecine et de Climatologie de Nice.—Nice Médical 17^{e} année, 1892–93, Nos. 1–12. la. 8°. Nice, 1892–93.

* **Nordenskiöld, A. E.**—The voyage of the Vega round Asia and Europe, with a historical review of previous journeys along the north coast of the old world. Translated by A. Leslie. Vols. i.–ii. 2 vols., la. 8°. London, 1881.

‖ ——— Om stoftfallet i Sverige och angränsande länder den 3:dje maj 1892. 8°. (*Geol. Fören. Förhandl., Stockholm*, xv., 1893, *p.* 417.)

[Odessa, Observatoire Météorologique de l'Université.]—Revue météorologique. Travaux du réseau météorologique du sud-ouest de la Russie l'année 1892. Vols. iii.–v. Par A. Klossovsky. 3 vols. la. 4°. Odessa, 1893.

Text in the Russian language.

Ottawa, Geological Survey of Canada.—Annual report. New Series, vol. v., 1890–91. Parts i. and ii. 2 vols., with maps. la. 8°. Ottawa, 1893.

For previous years see MONTREAL, GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA.

Paris, Académie des Sciences.—Comptes rendus hebdomadaires des séances. . . . Tomes, cxvi.–cxvii. 1893. 2 vols. 4°. Paris, 1893.

——— **Bureau Central Météorologique de France.**—Annales . . . publiées par E. Mascart. Année 1891. i.–iii. 3 vols. la. 4°. Paris, 1893.

——— ——— Bulletin international. xxxvii^{e} année, 1893. Jan. 1–Dec. 31. 4°.

——— ——— Rapport de la conférence météorologique internationale. Réunion de Munich, 1891.

See Munich.

——— **Bureau International des Poids et Mesures.**—Notice sur les thermomètres destinés à la mesure des basses températures. 8°. Paris, 1893.

——— **Ministère de la Marine et des Colonies.**—Revue maritime et coloniale. Tomes cxvii.–cxix. 3 vols. la. 8°. Paris, 1893.

——— **Service Hydrographique de la Marine.**—Annales hydrographiques 2^{e} sér. Tome xv. 1893. la. 8^{e}. Paris, 1893.

——— **Service Hydrométrique du Bassin de la Seine.**—Observations sur les cours d'eau et la pluie centralisées pendant l'année 1892 . . . 7 plates. f°. Versailles, s.a.

——— ——— Résumé des observations centralisées . . . pendant l'année 1892 . . . la. 8°. Versailles, 1893. (*Ann. soc. météor. Fr.*, xli., 1893, *p.* 315.)

——— **Société Météorologique de France.**—Annuaire. Tome xl. 1892. la. 8°. Paris, s.a.

Pascal, Blaise.—Récit de la grande expérience de l'équilibre des liqueurs. Paris, 1648.

See Hellmann, G., Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus. No. 2.

* **Patents for Inventions.**—Abridgments of specifications. Class 97, philosophical instruments, including optical, nautical, surveying, mathematical, and meteorological instruments. Period.—A.D. 1877–83. la. 8°. London, 1893.

Peek, C. E.—Meteorological observations for the year 1892. Rousdon Observatory, Devon. Vol. ix. 4°. London, 1893.

Peking, Inspectorate General of Customs.—Medical reports. 1889–90. 38th–40th Issues. 2 parts. 4°. Shanghai, 1894.

‖ **Pembrey, M. S.**—Comparative experiments with the dry and wet-bulb psychrometer and an improved chemical hygrometer. 8°. (*Phil. Mag.* 1893, *June*, *p.* 525.)

* **Pernetty, [A. J.]**—The history of a voyage to the Malouine (or Falkland) Islands, made in 1763 and 1764, under the command of M. de Bougainville, . . . and of two voyages to the Streights of Magellan, with an account of the Patagonians. Translated from Dom Pernety's Historical Journal written in French. 2nd edition. 4°. London, 1773.

* **Pernter, J. M.**—Über die Höfe und Ringe um Sonne und Mond und verwandte Erscheinungen. Vorträge des Vereines Verbr. naturwissensch. Kenntn. Wien, xxxi. Jahrg. Heft. 5. sm. 8°. Wien, 1891.

Perth, Land and Survey Department, Meteorological Branch.—Meteorological report for the years 1888 and 1889. 2 vols. f°. Perth, 1889–90.

Pesth, Königl. Ung. Central-Anstalt für Meteorologie und Erdmagnetismus.—Jahrbücher. xx. Bd., Jahrg. 1890. 4°. Budapest, 1893.

In the Hungarian language also.

Petermann's (Dr. A.) Mitteilungen aus Justus Perthes' geographischer Anstalt. Herausgegeben von A. Supan. 39 Bd., 1893. 4°. Gotha, s.a.

——— ——— aus Justus Perthes' geographischer Anstalt. Herausgegeben von A. Supan. Ergänzungsband xxiii. la. 8°. Gotha, 1893.

‖ **Petit, A.**—Untersuchungen über den Einfluss des Frostes auf die Temperaturverhältnisse der Böden von verschiedener physikalischer Beschaffenheit. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg*, xvi., *Heft.* 3, 4.)

Philadelphia, American Philosophical Society.—Proceedings of the American Philosophical Society held at Philadelphia for promoting useful knowledge. Vol. xxxi., 1893. la. 8°. Philadelphia, 1893.

——— **Franklin Institute.**—The journal of the Franklin Institute devoted to science and the mechanic arts. Vols. cxxxv.–cxxxvi., 1893. 2 vols. 8°. Philadelphia, 1893.

* **Phipps, [C.J.,] and Lutwidge, [S.]**—The journal of a voyage undertaken by order of His present Majesty, for making discoveries towards the North Pole, by the Hon. Commodore Phipps and Capt. Lutwidge, in His Majesty's sloops "Racehorse" and "Carcase." To which is prefixed, an account of the several voyages undertaken for the discovery of a North-East passage to China and Japan. 8°. London, 1774.

* **Pictet, M. A.**—An essay on fire. Translated from the French . . . . by W.B. sm. 8°. London, 1791.

Pietkiewicz, A.—Jednoczesny stan pogody oraz jéj zmiany na pewnéj przestrzeni. (L'état simultané de temps dans une certaine étendue et ses changements.) la. 8°. (*Pamietnik Fizyjogr., Warsaw*, x., 1890, *p.* 157.)

——— Slowo o krzywéj wyrównanych temperatur dziennych Warszawy przez Boleslawa Danielwicza. la. 8°. (*Pamietnik. Fizyjogr., Warsaw*, x., 1890, *p.* 183.)

* **Poincaré, H.**—Théorie des tourbillons. Leçons professées pendant le deuxième semestre 1891–92, par H. Poincaré, rédigées par M. Lamotte. la. 8°. Paris, 1893.

Pola, hydrographisches Amt der k. k. Kriegsmarine.—Meteorologische und magnetische Beobachtungen. 1893, Jan.–Dec., and Results. oblong la. 8°.

——— **K. K. hydrographisches Amt.**—Mittheilungen aus dem Gebiete des Seewesens. Jahrg. 1893. xxi. Bd. la. 8°. Pola, 1893.

Pomortzeff, M. M.—Apparatus to determine the directions and angular movements of clouds. 8°. (St. Petersburg, 1893.)

‖ ——— Determination of the directions and angular velocity of the movement of clouds. la. 8°. (St. Petersburg, 1893.) [*Bull. Imp. Russian Geogr. Soc.*, xxix., 1893.]
In the Russian language. Title only in English.

‖ **Porro, F.**—Latitudine di Torino determinata coi metodi di Guglielmo Struve. Pubbl. R. Osserv. Astr. Torino, N. iii. sm. f°. Torino, 1893. (*Mem. R. Accad. Sc. Torino, ser.* ii., xliv., 1893.)

Porto Rico, Jefatura de Obras Públicas de la Isla de Puerto Rico.—Resúmen de las observaciones meteorológicas verificadas. 1893. Jan.–Dec. 8°. Sheets.

‖ **Pouchet, G.**—Sur les eaux vertes et bleues observées au cours du voyage de "La Manche." la. 8°. (*Compt. rend. assoc. franç. avanc. sc.*, 1892.)

Prague, K. K. Sternwarte.—Magnetische und meteorologische Beobachtungen . . . . 1892. 53 Jahrg. la. 4°. Prag, 1893.

Prague, Technisches Bureau des Landesculturrathes für das Königreich Böhmen.—Ergebnisse der ombrometrischen Beobachtungen in Böhmen für das Jahr 1892. 4°. Prag, 1893.
In the Czech language also.

——— ——— Ergebnisse der Wasserstandsbeobachtungen an den Flüssen Böhmens für das Jahr 1892. 4°. Prag, 1893.
In the Czech language also.

Prince, C. L.—Observations upon the great drought during the spring months of 1893. sm. f°. Dated, Crowborough Hill, 1893.

Puebla, Observatorio Meteorológico del Colegio del Estado de Puebla.—Resúmen correspondiente a cada dia. 1892. Jan.–Dec. sm. f°.

Radford, [W. T.]—Climate of Sidmouth. Dec. 1874–Dec. 1894. Slips. July 1877 and June 1884 missing.
See also Heineken, N. S.

Reynman, L.—Wetterbüchlein von währer Erkenntniss des Wetters. 1510.
See Hellmann, G.—Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus. No. 1.

‖ **Riccò, A.**—Sulla relazione fra la perturbazioni magnetiche e le macchie solari. sm. f°. (*Mem. soc. spettr. Ital.*, xxiii., 1894.)

Riccó, A. e Saija, G.—Osservazioni termometriche eseguite nel R. Osservatorio Etneo. 8°. (*Boll. mens. Accad. Gioenia Sc. Nat. Catania, Fasc.* xxxvi., 1894.)

Richard Brothers.—Automatic recording instruments (Système Richard Frères), . . . for science, engineering, and commerce. Illustrated and descriptive catalogue. 4°. London, 1894.

‖ **Richter, H.**—Die Einrichtung der Wasserstands-Voraussage an der oberen Elbe. f°. Berlin, 1894. (*Zeitschr. f. Bauwesen*, 1894.)

|| **Riggenbach, A.**—Die Niederschlagsverhältnisse des Kantons Basel und ihre Beziehung zur Bodengestalt. 8°. (*Verhandl. Naturf. Gesellsch. Basel.* x., *Heft* 2, *p.* 425.)

|| ——— Witterungs-Übersicht des Jahre 1892. 8°. (*Verhandl. naturf. Gesellsch. Basel*, x., 1893, *p.* 278.)

Rio de Janeiro, Observatorio.—Annuario. 1893. Anno ix. sm. 8°. Rio de Janeiro, 1893.

Riposto, Osservatorio Meteorologico del R. Istituto Nautico.—Bollettino mensile. Anno xix., 1893. Fasc. 1–12. sm. f°. Riposto, 1893.

Rome, Specola Vaticana.—Classificazione delle nubi. sm. f°. Roma, 1893.

——— ——— Pubblicazioni. Fasc. iii. sm. f°. Roma, 1893.

——— **Ufficio Centrale Meteorologico e Geodinamico Italiano.**—Bollettino meteorico. Anno xv., 1893. Jan. 1–Dec. 31. la. 4°. Sheets.

——— ——— Rivista Meteorico-Agraria. Anno xiv., 1893, N. 1–36. la. 8°. (Roma, 1893–94.)

|| **Rotch, A. L.**—Meteorology at the Paris Exposition. la 8°. (*Rep. U.S. Commrs. to the Universal Exposition of* 1889 *at Paris*, ii., *p.* 239.)
Contains also "Proc. Internat. Meteor. Congr., and Internat. Hydrol. and "Climatol. Congr., held at Paris during the Exposition."

* **Rudolph, E.**—Ueber submarine Erdbeben und Eruptionen. la. 8°. (*Beitr. z. Geophys., Abhandl. geogr. Seminar Univ. Strassburg, I., p.* 133, *Stuttgart*, 1887.)

Rugby School Natural History Society.—Report . . . for the years 1892–93. 2 vols., 8°. Rugby, 1893–94.

|| **Russell, H. C.**—Hail-storms. Read . . . Nov. 2, 1892. 8°. (*Journ. R. Soc. N.S.W.*, xxvi.)

|| ——— Moving anticyclones in the southern hemisphere. la. 8°. (*Quart. Journ. R. Meteor. Soc.* xix., 1893, *p.* 24.)

|| ——— Pictorial rain maps. Read . . . Nov. 1, 1893. 8°. (*Journ. R. Soc. N.S.W.*, xxvii.)

* **Russell, Hon. R.**—On hail. la. 8°. London, 1893.

|| **Sabine, Sir E.**—Contributions to terrestrial magnetism. Nos. xiv.–xv. 2 vols., la. 4°. (*Phil. Trans.*, clxv., 1875, *p.* 161; clxvii., 1877, *p.* 461.)

St. Kitts.—Meteorological record for St. Kitts for 1892. By E. A. Hancock. la. 8°. (*Suppl. to Leeward Islands Gazette*, 1893, *June* 15.)

St. Petersburg, Kaiserliche Akademie der Wissenschaften.—Repertorium für Meteorologie. . . . Redigirt von H. Wild. Bd. xvi. sm. f°. St. Petersburg, 1893.

[St. Petersburg, Ghlavn. Fiz. Observatoriya. — Ezhemyesyachn'ïi meteorologhïcheskiï byulleten dlya Evropeïskoï Rossii.] (St. Petersburg, Central Physical Observatory. Monthly meteorological bulletin.) (1893. i. la. 4°. [Sanktpeterburgh,] 1893.

——— **Observatoire Physique Météorologique.**—Bulletin météorologique 1893, Jan. 1–Dec. 31. f°. Sheets.
In the Russian language also.

——— **Physikalisches Central-Observatorium.**—Annalen . . . heraus gegeben von H. Wild. Jahrg. 1892. Theil i. und ii. 2 vols. sm. f°. St. Peters burg, 1893.

[——— Scientific Department of the Naval Technical Committee.]—Naval Repertory. 1893. Nos. 6–12. la. 8°. St. Petersburg, 1893.
In the Russian language.

San Fernando, Instituto y Observatorio de Marina.—Anales. Sección 2ª. Observaciones meteorológicas y magnéticas. Año 1892. f°. San Fernando, 1893.

San Luis Potosi, Observatorio del Colegio-Seminario.—Cuadro meteorografico de la lluvia durante los años de 1891, 1892 y 1893. 4°. San Luis Potosi, 1894.

——— ——— Resumen de las observaciones efectuadas durante los años de 1892 y 1893. 2 parts. 8° and 4°. San Luis Potosi, 1893–94.

Schoenrock, A.—Ein merkwürdiger Temperatursprung in St. Petersburg und seiner Umgegend am 11 Februar 1893. sm. f°. (*Repert. Meteor.*, xvi.)

* **Schott, G.**—Technica curiosa, sive mirabilia artis, libris xii. comprehensa; . . . . sm. 4°. Norimbergæ, 1664.

‖ **Schreiber, P.**—Die Grundgleichungen für Zustand und Zustandsänderung in der Atmosphäre. Vorgetragen am 10 Okt. 1893 in der Sitzung des Zweigver. Chemnitz des Sächs. Ingen.-Archit.-Ver. 4°. (*Civilingenieur*, xxxix., *Heft.* 8.)

‖ ——— Ueber die in Nordamerika angestellten Versuche zur künstlichen Erzeugung von Regen nach dem amtlichen Bericht des vom landwirthschaftlichen Amt der Regierung der Vereinigten Staaten hierzu bestellten Spezialagenten. 8°. (*Mitth. Oekon. Gesellsch. K. Sachs., Dresden*, v., 1892–93.)

——— General-Bericht über den gegenwärtigen Stand unserer Kenntnisse über Gewitter und die begleitenden Erscheinungen im Königreich Sachsen. la. 8°. Chemnitz, (1893).

‖ ——— Die klimatischen Grundgleichungen des Königreichs Sachsen. sm. f°. (*Meteor. Zeitschr.*, 1893, *Okt.*, *p.* 361.)

‖ **Schück, A.**—Beobachtungen über [Temperatur], Salzgehalt und specifisches Gewicht des Meerwassers zwischen den norwegischen Scheren. sm. f°. (*"Ausland,"* 1893. *Nr.* 40 *u.* 41.)

——— Magnetische Beobachtungen an der Unterelbe, angestellt im Jahre 1893. 8°. Hamburg, [1894].

‖ **Scott, R. H.**—Fifteen years' fogs in the British Islands, 1876–1890. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xix., 1893, *p.* 229.)

——— The publication of daily weather maps and bulletins. la. 8°. [*Rep. Internat. Meteor. Congr., Chicago, Aug.* 1893. *Part* i., *p.* 6.]

——— Questions and answers on meteorology, being an abridgment of "Elementary Meteorology." sm. 8°. London, 1893.

* ——— The study of weather and of climate. 8°. [*Longman's Mag.*, 1893, *May*, *p.* 62.]

* ——— The study of weather and of climate. 4°. (*Longman's School Mag.*, i., 1893, *Aug.*, *p.* 109.)

* ——— Weather forecasts. la. 8°. (*New Rev.*, ix., 1893, *Oct.*, *p.* 416.)

Seeland, F.—Magnetische und meteorologische Beobachtungen zu Klagenfurt. Dec. 1892–Nov. 1893 and year. 8°. s.l.e.a.

Shanghai Meteorological Society.—First annual report. For the year 1892. By Rev. F. S. Chevalier. la. 8°. Zi-ka-wei, 1893.

Singapore, Principal Civil Medical Officer, Straits Settlements.—Annual meteorological report, Straits Settlements, for the year 1892. f°. s.l.e.a.

Smith, H.—Rainfall and temperature at Kenley, for six years, 1888 to 1893. oblong 8°. Sheet.

Sofia, Station Météorologique.—Bulletin annuaire, 1891–93. oblong la. 8°. Sheets.

In the Russian language also.

Somers, A. N.—A fall of coloured snow. la. 4°. (*Science*, xxi., 1893, *June* 2, p. 303.)

Southport, Fernley Observatory.—Report, and results of observations, for the year 1892. By J. Baxendell. 4°. Southport, 1893.

See also BAXENDELL, J.

‖ **Sterneck, R. von.**—Relative Schwerebestimmungen ausgeführt im Jahre 1892, in Berlin, Potsdam, und Hamburg, in den Ost-Alpen, Karpaten, und der ungarischen Tiefebene. 8°. Wien, 1893. (*Mittheil. k. u. k. milit. geogr. Inst.*, xii., 1892.)

Stockholm, Académie Royale des Sciences de Suède.—Observations du magnétisme terrestre faites à Upsala sous la direction de R. Thalén pendant l'exploration internationale des régions polaires en 1882–83. Calculées et rédigées par E. Solander. la. 4°. Stockholm, 1893.

Stockholm, Kongl. Svenska Vetenskaps-Akademie. — Meteorologiska Iakttagelser i Sverige utgifna af Kongl. Svenska Vetenskaps-Akademien, anställda och utarbetade under inseende af meteorologiska Central-Anstalten. Bd. xxix., xxx., 2 dra. ser., Bd. 15, 16. 1887, 1888. 2 vols., la. 4°. Stockholm, 1892–93.
In the French language also.

——— **Meteorologiska Central-Anstalt.**—Månadsöfversigt af väderleken i Sverige till landtbrukets tjenst utgifven under meteorologiska Central-Anstaltens inseende af Dr. H. E. Hamberg. Årgång xiii 1893. f°. Stockholm, 1893.

Stonyhurst College Observatory.—Results of meteorological, magnetical, and solar observations. By the Rev. W. Sidgreaves. 1893. sm. 8°. Clitheroe, 1894.
The Appendix contains "Results of meteor. obsns. taken at St. Ignatius' College, Malta, by the Rev. J. Dobson. 1893."

‖ **Strachey, R.**—Harmonic analysis of hourly observations of air temperature and pressure at British Observatories. Part I., Temperature. la. 4°. London, 1893. (*Phil. Trans.*, clxxxiv., 1893, *A.*, *p.* 617.)

‖ ——— Harmonic analysis of hourly observations of air temperature and pressure at British Observatories. Part I., Temperature. 8°. (*Proc. R. Soc.*, liii., 1893, *p.* 66.)

Straits Settlements.—Annual report of the State of Selangor for the year 1892. By E. W. Birch. sm. f°. Kuala Lumpur, 1893.

——— Annual report on the State of Negri Sembilan for the year 1892. sm. f°. s.l.e.a.

Strassburg, Meteorologischer Landesdienst. — Ergebnisse der meteorologischen Beobachtungen im Reichsland Elsass-Lothringen im Jahre 1891. Herausgegeben von . . . H. Hergesell. la. 4°. Strassburg, 1893.

——— Uebersicht über die Witterungs-Verhältnisse Elsass-Lothringens. 1893. Jan.–Dec. Beilage der Strassburger Correspondenz, 1893–94. 4°.

Stuttgart, Kgl. Statistisches Landesamt.—Instruktion für die Beobachter der württembergischen meteorologischen Stationen. 8°. Stuttgart, 1893.

——— ——— **Meteorologische Zentralstation.**—Veröffentlichungen des K. Statistischen Landesamts. Witterungsübersicht . . . nach den Beobachtungen der württemb. meteor. Stationen. 1892, Dec. and year. 1893, Jan.–Dec., year. f°. Sheets. (*Sonderabdruck aus Staats-Anzeigers für Württemb.*, 1893–94.)

——— **Meteorologische Centralstation.** — Deutsches meteorologisches Jahrbuch. Jahrg. 1892. Meteorologische Beobachtungen in Württemberg. Mitteilungen der mit dem Königlichen statistischen Landesamt verbundenen meteorologischen Centralstation. Bearbeitet von L. Meyer. la. 4°. Stuttgart, 1893.

‖ **Sundell, A. F.**—Åskvädren i Finland. 1892. 8°. Helsingfors, 1893. [*Bidr. Känn. Finl. natur. o folk.*]

——— Berättelse öfver komparationen af Justeringskommissionens hufoudlikare för vigt med Finska statens urtyp för kilogrammet. la. 8°. Helsingfors, 1891.
Title in the French language also.

‖ ——— Snötäckets höjd i Finland, Januari–Maj 1891. la. 8°. (*Fennia, Helsingfors*, vii., *No.* 3, 1892.)

Sydney Observatory.—Diagram of isothermal lines of New South Wales. la. 8°. s.l.e.a.

[———] Meteorological observations at Sydney. 1892, Jan.–Dec. 8°. s.l.e.a.

[———] Results of meteorological observations made in New South Wales during 1890, under the direction of H. C. Russell. la. 8°. Sydney, 1892.

[———] Results of rain, river, and evaporation observations made in New South Wales during 1891–92, under the direction of H. C. Russell. 2 vols., la. 8°. Sydney, 1893.

——— Weather chart of Australia and New Zealand. 1891–92. Jan.–Dec. f°. Sheets.

——— **Royal Society of New South Wales.**—Journal and proceedings. Vol. xxvi., 1892. 8°. Sydney [1893].

(Symons, G. J.)—The spring drought of 1893. 8°. (*Journ. R. Agric. Soc. Engl.*, 3*rd ser.*, iv., *Part* ii., *No.* 14, 1893, *p.* 339.)

Symons, G. J.—Rainfall records in the British Isles. la. 8°. (*Journ. Soc. Arts*, xlii., 1894, *p.* 298.)

——— **and Wallis, H. S.**—British rainfall, 1892. On the distribution of rain over the British Isles, during the year 1892 . . . 8°. London, 1893.

Symons's Monthly Meteorological Magazine.—Vol. xxviii., 1893. 8°. London, 1894.

Syracuse, Osservatorio Centrale di Siracusa.—Osservazioni meteorologiche fatte nell' osservatorio centrale di Siracusa e nelle stazioni della rete meteorico-agraria della provincia. Anno xvi., 1892, Jan.-Dec. 8°. Siracusa, 1892.

Tacubaya, Observatorio Astronómico Nacional.—Anuario. 1894. Año xiv. Formado bajo la dirección del Ingeniero A. Anguiano. sm. 8°. México, 1893.

Tananarive, Observatoire Royal de Madagascar.—Observations météorologiques faites à Tananarive par E. Colin. Vol. iv., 1892. 8°. Tananarive, 1893.

Tebbutt, J.—Report of Mr. Tebbutt's Observatory, the Peninsula, Windsor, New South Wales, for the year 1892. 8°. Sydney, 1893.

* **Teisserenc de Bort, L.**—Report on the present state of our knowledge respecting the general circulation of the atmosphere. Presented to the Meteor. Congr. at Chicago, August, 1893. 4°. London, 1893.

* **Thompson, R.**—Tables of temperature, for the use of gardeners; arranged according to the latitudes of the respective localities in which the observations have been made. la. 8°. (*Journ. Hortic. Soc.*, iv., 1849, *p.* 117.)

* ——— An abstract of meteorological observations in the garden of the Society [1852–53]; in continuation of those published, vol. vii., p. 138. la. 8°. (*Journ. Hortic. Soc.*, ix., 1854, *p.* 195.)

* **Thomson, T.**—History of the Royal Society from its institution to the end of the eighteenth century. 4°. London, 1812.

Tiflis, Physikalisches Observatorium.—Beobachtungen. 1891. la. 4°. (Tiflis), 1893.

——— Beobachtungen der Temperatur des Erdbodens. 1886–87. la. 8°. Tiflis, 1893.

In the Russian language also.

Tokio, Central Meteorological Observatory.—Annual report. 1891. Parts i. and ii. 2 vols. sm. f°. Tokio, s.a.

——— Chart showing signal stations in Japan. f°. Sheet. Dated, January, 1893.

——— Monthly report. Meteorological observations in Japan. 1892. Jan.-Dec. la. 8°. s.l.e.a.

In the Japanese language also.

From Jan.-Sept. the title is "Meteorological Central Observatory."

——— Weather maps. 1893. Jan.-Dec. 4°.

In the Japanese language also.

Toronto, Magnetical Observatory.—General meteorological register for the year 1892. 8°. s.l.e.a.

——— Instructions for the observation of aurora. 4°. Dated, October, 1848.

Trieste, I. R. Accademia di Commercio e Nautica.—Osservazioni meteorologiche instituite all' Osservatorio Marittimo. 1893, Jan.-Dec., and Results. oblong la. 8°. Sheets.

——— **Osservatorio Astronomico-Meteorologico.**—Rapporto annuale . . . contenente le osservazioni meteorologiche di Trieste e di alcune altre stazioni Adriatiche per l'anno 1891. Redatto da E. Mazelle. Vol. viii. la. 4°. Trieste, 1894.

Trinidad, Royal Botanic Gardens.—Meteorological Returns. 1893. Jan.-Dec. sm. f°. Sheets.

‖ **Turin, Osservatorio della R. Università.**—Osservazioni meteorologiche . . . . 1892 . . . . calcolate dal G. B. Rizzo. la. 8°. Torino, 1893. (*Atti R. Accad. Sc. Torino*, xxviii., 1893.)

——— **Reale Osservatorio Astronomico.**—Pubblicazioni. N. iii.

See Porro, F.

Upsala, Observatoire Météorologique de l'Université.—Bulletin mensuel. Par H. H. Hildebrandsson. xxiv., 1892. la. 4°. Upsal, 1892–93.

——— ——— Bulletin mensuel. Appendices: Recherches sur le climat d'Upsal. I. Pluies par. T. Wigert. la. 4°. Upsal, 1893.

Utrecht, Koninklijk Nederlandsch Meteorologisch Instituut.—Nederlandsch meteorologisch jaarboek. 1892. xliv. Jaarg. oblong 8°. Utrecht, 1893.

——— ——— Onweders in Nederland. Deel xiii., 1892. la. 8°. Amsterdam, 1893.

——— ——— Waarnemingen in den Indischen Oceaan over de maanden Maart, April en Mei. oblong f°. Utrecht, 1893.

Vaughan, J. D. W.—Meteorological observations taken at Suva, Fiji. 1886–92. f°. Suva, 1893.

Veeder, M. A.—Periodic and non-periodic fluctuations in the latitude of storm tracks. (Abstract of a paper read at the Internat. Congr. of Meteorology at Chicago, 1893.) 4°. Sheet.

——— The aurora. la. 4°. (*Science*, xxi., 1893, *June* 2, *p.* 304.)

|| **Vienna, Kais. Akademie der Wissenschaften.**—Berichte der Commission für Erforschung des Östlichen Mittelmeeres. Zweite Reihe. la. 4°. (*Denkschr. k. Akad. Wissensch. Wien*, lx.)

——— **K. K. Central-Anstalt für Meteorologie und Erdmagnetismus.**—Beobachtungen. 1893, Jan.–Dec., and Results. 8°.

——— ——— Jahrbücher. Jahrg. 1891. Neue Folge xxviii. Bd. la. 4°. Wien, 1893.

——— ——— Jelinek's Anleitung zur Ausführung meteorologischer Beobachtungen nebst einer Sammlung von Hilfstafeln. Vierte umgearbeitete Auflage. Theil. i. la. 8°. Wien, 1893.

——— ——— Telegrafischer Wetterbericht. Jahrg. xvii., 1893. Jan. 1–Dec. 31. la. 4°. Sheets.

——— **Kais. Königl. geographische Gesellschaft.**—Mittheilungen. 1893. xxxvi. Bd. (der neuen Folge xxvi.) la. 8°. Wien, 1893.

|| ——— **K. K. Sternwarte.**—Meteorologische Beobachtungen auf der K. K. Sternwarte in den Jahren 1887 und 1888. la. 4°. Wien, 1893. (*Ann. Wien. Sternwarte*, Bd. ix.)

——— **Sonnblick Verein.**—Jahres-Bericht des Sonnblick-Vereines für das Jahr. 1892. sm. f°. Wien, 1893.

Vilafranca del Panadés, Observatorio Meteorológico.—Observaciones meteorológicas efectuadas durante el año 1892, publicadas por el Director J. Baltá de Cela. la. 8° Vilafranca del Panadés, 1893.

See also Atmósfera, La.

Volante, G.—Osservazioni meteorologiche fatte in Alessandria alla Specola del Seminario nell' anno 1892. Anno xxxv. la. 8°. Alessandria, 1893.

Walcott, R. B.—Summary of rainfall observations at Barbados. 1884; 1886, Jan.–June; 1887, Sept.–Dec. and year; 1888, Jan.–June. Sheets.

|| **Ward, R. De C.**—Recent foreign studies of thunderstorms. I. Great Britain. 8°. (*Amer. Meteor. Journ.*, ix., 1892–93, *p.* 532.)

|| ——— Thunderstorms in New England during the years 1886 and 1887. la. 4°. Cambridge, Mass., 1893. (*Ann. Astr. Obs. Harvard Coll.*, xxxi., *Part* 2, *p.* 261.)

|| **Warsaw, Oddzial Warszawski Towarzystwa popierania Przemysłu i Handlu.**—Spostrzeżenia meteorologiczne. 1889–1891. 3 vols. la. 8°. Warszawa, 1891, 1893. (*Odbitka z Pamietnika Fizyjogr.*, x.–xii., 1890–1892.)

(Washington, Department of Agriculture.)—Report of the Secretary of Agriculture, 1891. la. 8°. Washington, 1892.

——— ——— **Weather Bureau.**—Bulletin No. 8. Report on the climatology of the cotton plant. By P. H. Mell. 8°. Washington, 1893.

Washington, Department of Agriculture, Weather Bureau. Bulletin No. 10. The climate of Chicago. By H. A. Hazen. 1a. 8°. Washington, 1893.

——— ——— ——— Certain climatic features of the two Dakotas. See FINLEY, J. P.

——— ——— ——— Circular relating to international symbols to be employed for indicating meteorological phenomena. 1a. 8°. Dated, Washington, Jan., 1894.

——— ——— ——— Monthly weather review. 1893. 4°. Washington, 1893–94.

‖ ——— ——— ——— Report of the Chief of the Weather Bureau for 1892. By M. W. Harrington. 8°. Washington, 1893. (*Rep. Sec. of Agric.*, 1892, *p.* 551.)

——— ——— ——— Weather map. 1893. Jan. 1–Dec. 31. 1a. f°. Sheets.

——— **Hydrographic Office.**—Lines of equal magnetic variation for the year 1893. Chart. 1a. f°. Washington, 1893.

——— ——— Pilot charts of the North Atlantic Ocean. 1893, Jan.–Dec. and supplements. Charts. 1a. f°.

——— **Signal Office.**—Telegraph cipher. New edition, 1874. 1a. 8°. s.l.e.a.

——— **Smithsonian Institution.**—Smithsonian meteorological tables. Based on Guyot's meteorological and physical tables. No. 844, vol. xxxv. of Smithsonian Miscellaneous Collections. 1a. 8°. Washington, 1893.

——— ——— Smithsonian miscellaneous collections. Vols. xxxiv. and xxxvi. 2 vols. 1a. 8°. Washington, 1893.

* (——— **War Department, Surgeon General's Office.**)—Meteorological register for 12 years, from 1831 to 1842 inclusive: compiled from observations made by the Officers of the Medical Department of the Army at the military ports of the United States. Prepared under the direction of T. Lawson. 8°. Washington, 1851.

Watts, F.—Reports on the hurricanes passing over the West Indies during the month of August, 1893. (Suppl. to the Leeward Islands Gazette, 12th October 1893.) 1a. 8°.

Wellington, Meteorological Department.—[Meteorological observations in New Zealand.] 1892. sm. f°. (*Statist. New Zealand*, 1892, *p.* 80.)

Wetter, Das.—Meteorologische Monatschrift für Gebildete aller Stände. Herausgegeben von R. Assmann. x. Jahrg., 1893. 1a. 8°. Braunschweig, 1893.

* **Wharton, W. J. L.**—Captain Cook's journal during his first voyage round the world made in H.M. Bark "Endeavour," 1768–71. A literal transcription of the original MSS. Edited by Capt. W. J. L. Wharton. 4°. London, 1893.

Wigert, T.—Pluies d'Upsal.
See UPSALA, OBSERVATOIRE MÉTÉOROLOGIQUE. Bulletin mensuel. Appendices.

‖ **Wild, H.**—Über Unsicherheiten in den Regnault'schen Spannkräften des Wasserdampfes unterhalb 100° und daraus entspringende Differenzen der Correctionen von Siedethermometern je nach ihrer Verificationsart. sm. f°. St. Pétersbourg, 1893. (*Mél. phys. chim.*, xiii., *p.* 263.)

‖ ——— Über den säcularen Gang der magnetischen Declination in St. Petersburg-Pawlowsk. sm. f°. (*Mél. phys. chim.*, xiii., 1893, *p.* 273.)

‖ ——— Zusammenstellung der Beschlüsse der internationalen Meteorologen-Conferenzen von der Conferenz in Leipzig, August 1872, bis und mit der Conferenz in München, August 1891. sm. f°. St. Petersburg, 1893. (*Repert. Meteor.*, xvi., *No.* 10.)

‖ ——— Beiträge zur Entwicklung der erdmagnetischen Beobachtungsinstrumente. sm. f°. St. Petersburg, 1894. (*Repert. Meteor.*, xvii., *No.* 6.)

* **Wilk, E.**—Grundbegriffe der Meteorologie für höhere Schulen Zusammengestellt von E. Wilk. Zweite Auflage. sm. 8°. Leipzig, 1892.

Williams, C. T.—Aero-therapeutics, or the treatment of lung diseases by climate, being the Lumleian lectures for 1893 delivered before the Royal College of Physicians. With an address on the high altitudes of Colorado. 1a. 8° London, 1894.

Wiltshire Rainfall.—1893. oblong 8°. Marlborough, 1894.

|| **Wollny, E.** — Elektrische Kulturversuche. Zweite Mittheilung. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg*, xvi., *Heft* 3, 4.)

|| ——— Untersuchungen über die Permeabilität des Bodens für Luft. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg*, xvi., *Heft.* 3, 4.)

|| ——— Untersuchungen über den Einfluss der Struktur des Bodens auf dessen Feuchtigkeitsverhältnisse. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg*, xvi., *Heft.* 5.)

York, Yorkshire Philosophical Society.—Annual report . . . . for 1892. la. 8°. York, 1893.

Zenger, C.-V.—Le système du monde électro-dynamique. 8°. Paris, 1893.

Zi-ka-wei, Observatoire Magnétique et Météorologique. — Bulletin mensuel. Tome xviii., année 1892. sm. f°. Zi-ka-wei, 1893.

Zürich, Schweiz. Departement des Innern.—Graphische Darstellung der schweizerischen hydrometrischen Beobachtungen. 1893. la. f°. Sheets.
For the second half of the year the title is in French.

——— **Schweizerische Meteorologische Central-Anstalt.** — Annalen. 1891. "Der Schweiz. meteor. Beob." xxviii. Jahrg. 4°. Zürich, s.a.

——— ——— Instruktionen für die Beobachter der meteorologischen Stationen der Schweiz. Zweite umgearbeitete und vermehrte Auflage. la. 8°. Zürich, 1893.

——— ——— Wetterbericht. 1893, Jan. 1–Dec. 31. sm. f°. Sheets.

Account of Receipts and Payments for the year ending 31st March 1894.

Receipts.	£ s. d.	£ s. d.	Payments.	£ s. d.	£ s. d.
Balance from year 1892–93		1,500 8 2	Administration:		
Parliamentary Vote		15,300 0 0	Payment of Council	991 5 0	
Repayment of expenses charged under—			Secretary	800 0 0	
(1.) Incidental expenses	3 4 1		Salaries and wages	903 18 8	
(2.) Observatories	37 11 7		Rent, fuel, and lighting	704 13 11	
		40 15 8	Incidental and contingent expenses	241 1 11	
Supply of Information:			Furniture and fittings	161 4 8	
Daily Weather Charts and Forecasts	283 10 6		Pensions	186 16 4	
6 p.m. Charts	25 0 0				3,989 0 6
Reports for Press Agencies, &c.	91 14 4		Special Researches:		
Telegrams	288 17 2		Salaries and other charges	- - -	787 6 11
		689 2 0	Land Meteorology:		
Sale of Instruments, &c.:			Observatories and stations, including remuneration of observers	2,390 17 10	
Royal Navy	3 10 8		Salaries: —Discussion and reduction of observations, &c.	1,297 2 8	
Mercantile Marine account	25 18 1				3,688 0 1
M.O. (Stations) account	30 15 0		Weather Information and Forecasts:		
		60 3 9	Telegraphic reports and storm warnings, remuneration of observers, &c.	2,485 8 3	
Repayment of Miscellaneous Commissions executed for Colonial and Foreign Institutions, &c.		40 5 7	Salaries: — Preparation and issue of reports and forecasts	1,861 11 3	
Commission charged on work done for Colonies, &c.		6 7 10			4,346 19 6
			Inspections:		
			Salaries and travelling expenses	- - -	589 6 7
			Ocean Meteorology:		
			Salaries:—Discussion and reduction of observations	1,597 15 0	
			Expenses incidental to the supply of instruments:—		
			Proportion for care and issue of instruments	200 0 0	
			Royal Navy	525 12 1	
			Mercantile Marine	355 2 3	
			Distant island and coast stations	14 0 8	
					2,692 10 0
			Miscellaneous Commissions executed for Colonial and Foreign Institutions, &c.	- - -	26 6 6
			Balance:		
			Cash at Bank	1,448 0 5	
			„ at Office	69 12 6	
					1,517 12 11
	£	17,637 3 0		£	17,637 3 0

In the year 1893–94 the sum of 1,475*l.* 3*s.* 10*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires, &c.

APPENDIX XIV.

LIST OF PUBLICATIONS, &c. issued under the Authority of the Meteorological Council.

OFFICIAL.

No. 1. Report of the Meteorological Committee for 1867. 1*s.*
2. Instructions for Meteorological Telegraphy. New Edition, 1891. Prepared for the use of observers exclusively.
3. Fishery Barometer Manual. (New edition, 1887.) 6*d.*
4. Charts showing the Surface Temperature of the South Atlantic Ocean in each Month of the Year. 2*s.* 6*d.*
5. Report of the Meteorological Committee for 1868. 5*d.*
6. Report of the Meteorological Committee for 1869. 10*d.*
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5*s.* each.
8. Barometer Manual. (Out of print. See Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5*s.* each.
10. Report of the Meteorological Committee for 1870. 10*d.*
11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2*s.* 6*d.*
12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2*s.* 6*d.*
13. A Discussion of the Meteorology of that Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. With Book of Charts, 5*s.*
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s.* each.
15. Report of the Meteorological Committee for 1871. 10*d.*
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5*s.* each.
17. Report of the Meteorological Committee for 1872. 1*s.*
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2*s.*
19. Quarterly Weather Report for 1873.—Parts I. to IV. 5*s.* each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20° — 30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20*s.*
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1873. 1*s.*
22. Report of the Meteorological Committee for 1873. 4*d.*
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2*s.*
24. Instructions in the Use of Meteorological Instruments. [Reprinted 1892.] (New edition in course of preparation.) 2*s.* 6*d.*
25. Quarterly Weather Report for 1874.—Parts I., II., and IV., 5*s.* each. Part III., 5*s.* 9*d.*
26. Report of the Meteorological Committee for 1874. 6*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. 24*s.*

28. Contribution to the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger.* 1*s.*

29. Report of the Meteorological Committee for 1875. 4*d.*

30. Quarterly Weather Report for 1875.—Parts I.—IV. 5*s.* each.

31. Report of the Meteorological Committee for 1876–7. 3*s.* 5*d.*

32. The Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. With Book of Charts. 15*s.*

33. Quarterly Weather Report for 1876 (New Series).—Part I., 6*s.*; Parts II., III., and IV., 5*s.* each.

*33A. Meteorological Observations at Stations of the Second Order for the year 1876.

33B. Meteorological Observations at Stations of the Second Order for the year 1877.

34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Vol. I.: Part I., 2*s.*; Part II., 10*s.*; Part III., 6*s.*; Part IV., 5*s.*; Part V., 6*s.*

35. Report of the Meteorological Council for 1877–8. 1*s.*

36. Report of the Proceedings of the Second International Meteorological Congress at Rome, 1879. 1*s.* 6*d.*

37. Report on the Meteorology of Kerguelen Island. By Rev. S. J. Perry, S.J., F.R.S. 3*s.*

38. Report of the Meteorological Council for 1878–9. 5*d.*

39. Meteorological Observations at Stations of the Second Order for the year 1878. 20*s.*

40. Aids to the Study and Forecast of Weather, by W. Clement Ley, M.A. 1*s.*

41. Report of the Meteorological Council for 1879–80. 1*s.*

42. Report of the Meteorological Council for 1880–81. 1*s.* 2*d.*

43. Meteorological Charts for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Charts, 25*s.*; Remarks, 7*s.*

44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E., by Capt. H. Toynbee, F.R.A.S. 7*s.* 6*d.*

45. Meteorological Observations at Stations of the Second Order for the year 1879. 20*s.*

46. Report on the Storm of October 13–14, 1881. By Robert H. Scott, F.R.S. 1*s.* 6*d.*

47. Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. 7*s.* 6*d.*

48. Report of the Meteorological Council for 1881–2. 1*s.*

49. Quarterly Weather Report for 1879. (New Series.) Parts I., II., and III., 6*s.* each; Part IV., 5*s.* 6*d.* Appendices and Plates. 27*s.*

50. Quarterly Weather Report for 1880. (New Series.) Parts I. and II., 6*s.* each; Part III., 4*s.*; Part IV., 6*s.* Appendices and Plates. 28*s.*

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* The Observations at Stations of the Second Order for the years 1873–1875 will be found in the Quarterly Weather Report for the respective years.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 51.* Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1881. (New Series.) Part I., 10*s.* 6*d.* Parts II., III., and IV., 21*s.* each.

52. Quarterly Weather Report for 1877. (New Series.) Part I., 10*s.*; Part II., 5*s.*; Part III., 4*s.* 6*d.*; Part IV., 6*s.* Appendices and Plates. 27*s.*

53. Meteorological Atlas of the British Isles. 5*s.* 6*d.*

54. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1882. Parts I. and II., 20*s.* each; Part III., 22*s.* 6*d.*; Part IV., 26*s.*

55. Quarterly Weather Report for 1878. (New Series.) Parts I., II., III., and IV., 6*s.* each. Appendices and Plates. 28*s.*

56. Sunshine Records of the United Kingdom for 1881. 4*s.*

57. Meteorological Observations at Stations of the Second Order for the year 1880. 34*s.* 6*d.*

58. Report of the Meteorological Council for 1882–3. 10½*d.*

59. Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. 21*s.*

60. Principles of Forecasting by means of Weather Charts. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition, revised.) 2*s.*

61. A Barometer Manual for the Use of Seamen. (Second edition.) 1*s.* 3*d.*

62. Monthly Weather Reports for 1884. Jan., Feb., March, May —Nov., 1*s.* 6*d.* each. April (with 2 Appendices), 2*s.* 6*d.* Dec., 1*s.* 9*d.*

63. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1883. Parts I., II., and III., 21*s.* each; Part IV., 30*s.*

64. Report of the Meteorological Council for 1883–4. 1*s.* 2*d.*

65. Monthly Weather Reports for 1885. Jan. to Dec., 1*s.* 6*d.* each.

66. Meteorological Observations at Stations of the Second Order for the year 1881. 35*s.*

67. Report of the Meteorological Council for 1884–5. 4*s.* 4*d.*

68. Monthly Weather Reports for 1886. Jan. to Dec., 1*s.* 6*d.* each.

69. Meteorological Observations at Stations of the Second Order for the year 1882. 35*s.*

70. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1884. Part I., 12*s.*; Part II., 10*s.*; Part III., 10*s.* 6*d.*; Part IV., 15*s.*

71. Synchronous Weather Charts of the North Atlantic and the adjacent Continents. Aug. 1, 1882, to Sept. 3, 1883. Parts I. to IV. (33 sheets each.) 17*s.* each.

72. Report of the Meteorological Council for 1885–86. 8*d.*

73. Meteorological Observations at Stations of the Second Order for the year 1883. 30*s.*

74. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1885. Parts I. and II., 11*s.* each; Part III., 10*s.* 6*d.* Part IV., 12*s.*

* For the years 1874–1880 the Hourly Readings were issued in lithographed form. Price 20*s.* per annum.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 75. Report of the Meteorological Council for 1886–87. 8*d.*

76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10*s.* 6*d.* Supplementary Chart, 6*d.*

*77. Monthly Weather Reports for 1887. January to April, 1*s.* 6*d.* each. May to December, in wrapper, 12*s.*

78. Meteorological Observations at Stations of the Second Order for the year 1884. 32*s.*

79. Report of the Meteorological Council for 1887–88. 1*s.*

80. Daily Weather Charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. 10*s.*

81. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1886. Parts I., II., and III., 10*s.* 6*d.* each. Part IV., 12*s.* 6*d.*

82. Meteorological Observations at Stations of the Second Order for the year 1885. 31*s.*

83. Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and the Army Medical Department. 1852–1886. 23*s.*

84. Report of the Meteorological Council for 1888–89. 5½*d.*

†85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4*d.* per week. With Appendices and Monthly Supplements, priced separately.

86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

87. Weekly Weather Report for the year 1890. Vol. VII. Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

88. Meteorological Observations at Stations of the Second Order for the year 1886. 25*s.*

89. Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo. 1886–88. By the late W. Reid, M.D. 8*s.* 6*d.*

90. Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. 7*s.*

91. Report of the Meteorological Council for 1889–90. 7½*d.*

92. Meteorological Charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras Hafún. 6*s.*

93. Harmonic Analysis of Hourly Observations of Air Temperature and of Pressure at British Observatories. 12*s.*

94. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1887. 16*s.*

95. Meteorological Observations at Stations of the Second Order for the year 1887. 24*s.*

96. Weekly Weather Report for the year 1891. Vol. VIII., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual subscription, including Supplements and Appendices, post paid 30*s.*

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* Publication continued after this year as a Supplement to the Weekly Weather Report.

† The publication of the Weekly Weather Report began in February 1878, Annual subscription, 1878–1883, 12*s.* 6*d.*; 1884–1887, 21*s.* 2*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 97. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1888. 20*s.*

98. Ten Years Sunshine in the British Isles, 1881–90. 2*s.*

99. Report of the Meteorological Council for 1890–91. 5½*d.*

100. Weekly Weather Report for the year 1892. Vol. IX., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, Post paid, 30*s.*

101. Meteorological Observations at Stations of the Second Order for the year 1888. 22*s.*

102. Report of the International Meteorological Conference at Munich in 1891. 1*s.* 6*d.*

103. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1889. 15*s.*

104. Report of the Meteorological Council for 1891–92. 6*d.*

105. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1890. 20*s.*

106. Wind and Current Charts of the Red Sea. (In the Press.)

107. Weekly Weather Report for the year 1893. Vol. X., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30*s.*

108. Meteorological Observations at Stations of the Second Order for the year 1889. 34*s.*

109. Report of the Meteorological Council for 1892–93. 8*d.*

110. Meteorological Observations at Stations of the Second Order for the year 1890. 34*s.*

111. Weekly Weather Report for the year 1894. Vol. XI., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30*s.*

112. Report of the Meteorological Council for 1893–94.

113. Hourly Means of the Readings obtained from the Self-recording Instruments at the Five Observatories under the Meteorological Council, 1891. (In the Press.)

114. Rainfall Tables of the British Isles for 1881–90. (In the Press.)

NON-OFFICIAL.

No. 1. Report of an Inquiry into the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6*d.*

2. Report to the Committee of the Meteorological Office on the Meteorology of the North Atlantic.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

3. Report to the Committee of the Meteorological Office on the Use of Isobaric Curves.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6*d.*

6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1872. 1*s.*

7. Notes on the Form of Cyclones in the Southern Indian Ocean. — By C. Meldrum, M.A., F.R.S. [Out of Print.]

8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 1873. 6*d.*

9. Report of the Permanent Committee of the First International Meteorological Congress at Vienna for 1874. 1*s.* 6*d.*

10. On the Physical Geography of the part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875.—By Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s.* 6*d.*

11. Report of the Permanent Committee of the First International Congress at Vienna for 1876. With Supplement. 2*s.*

12. Reports to the Permanent Committee of the First International Meteorological Congress at Vienna on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s.*

13. Report of the Permanent Committee of the First International Congress at Vienna for 1878. 6*d.*

14. Report of the International Meteorological Committee Meeting at Berne, 1880. 1*s.*

15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. 2*s.* 6*d.*

16. Report of the Third Meeting of the International Meteorological Committee, held at Paris, September 1885. 1*s.*

17. Report of the Fourth Meeting of the International Meteorological Committee, held at Zürich, September 1888. 4*d.*

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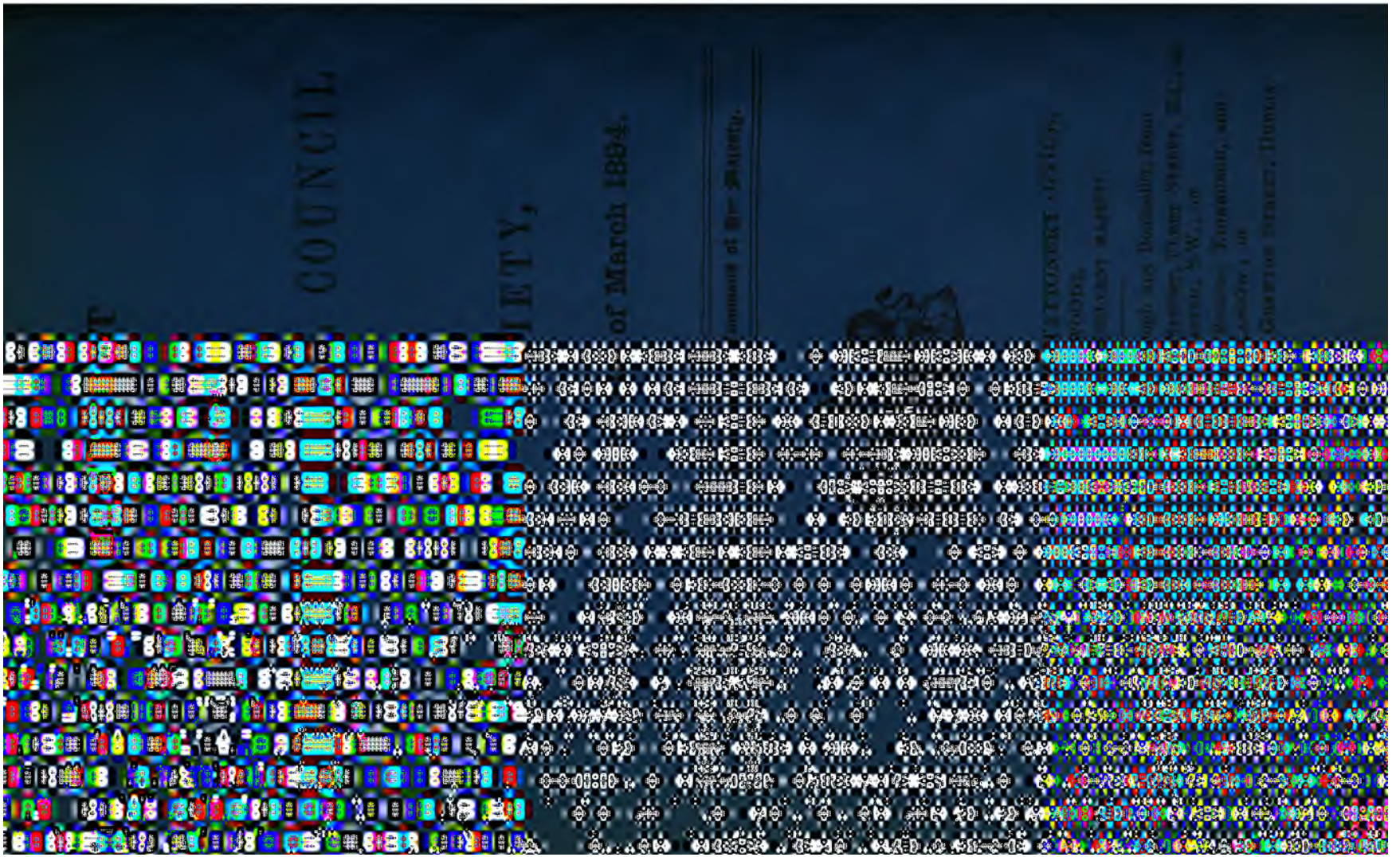
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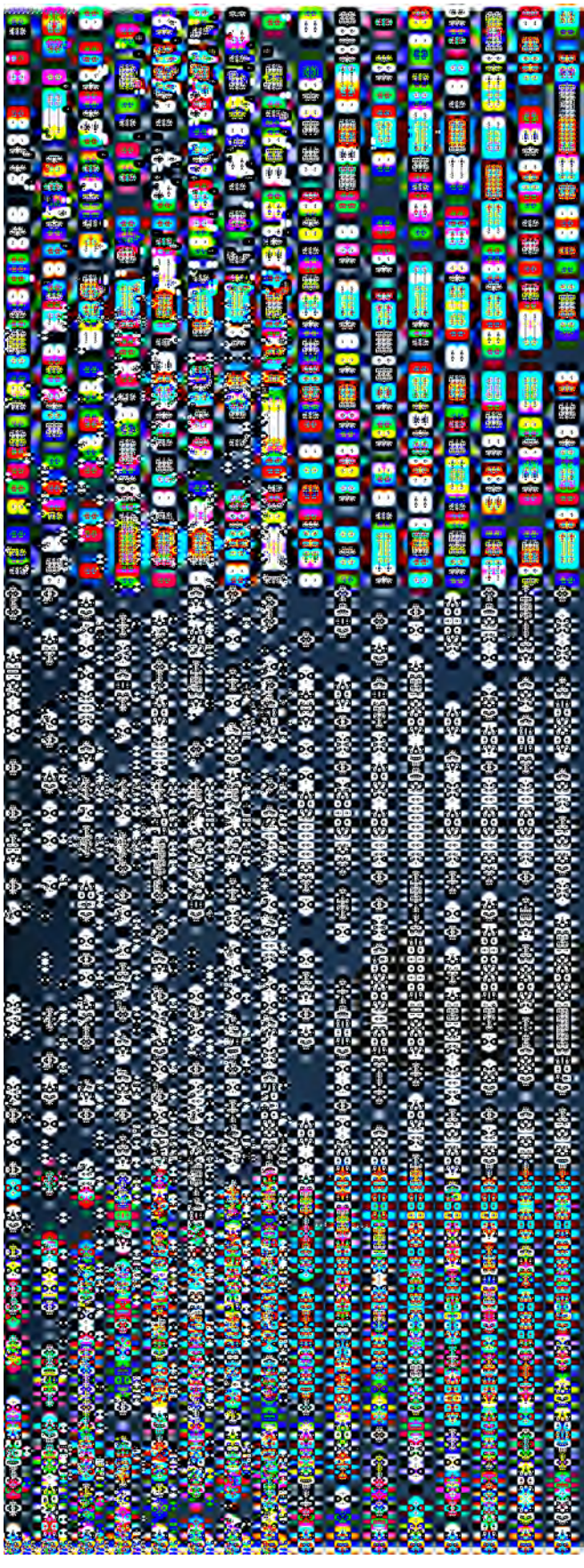

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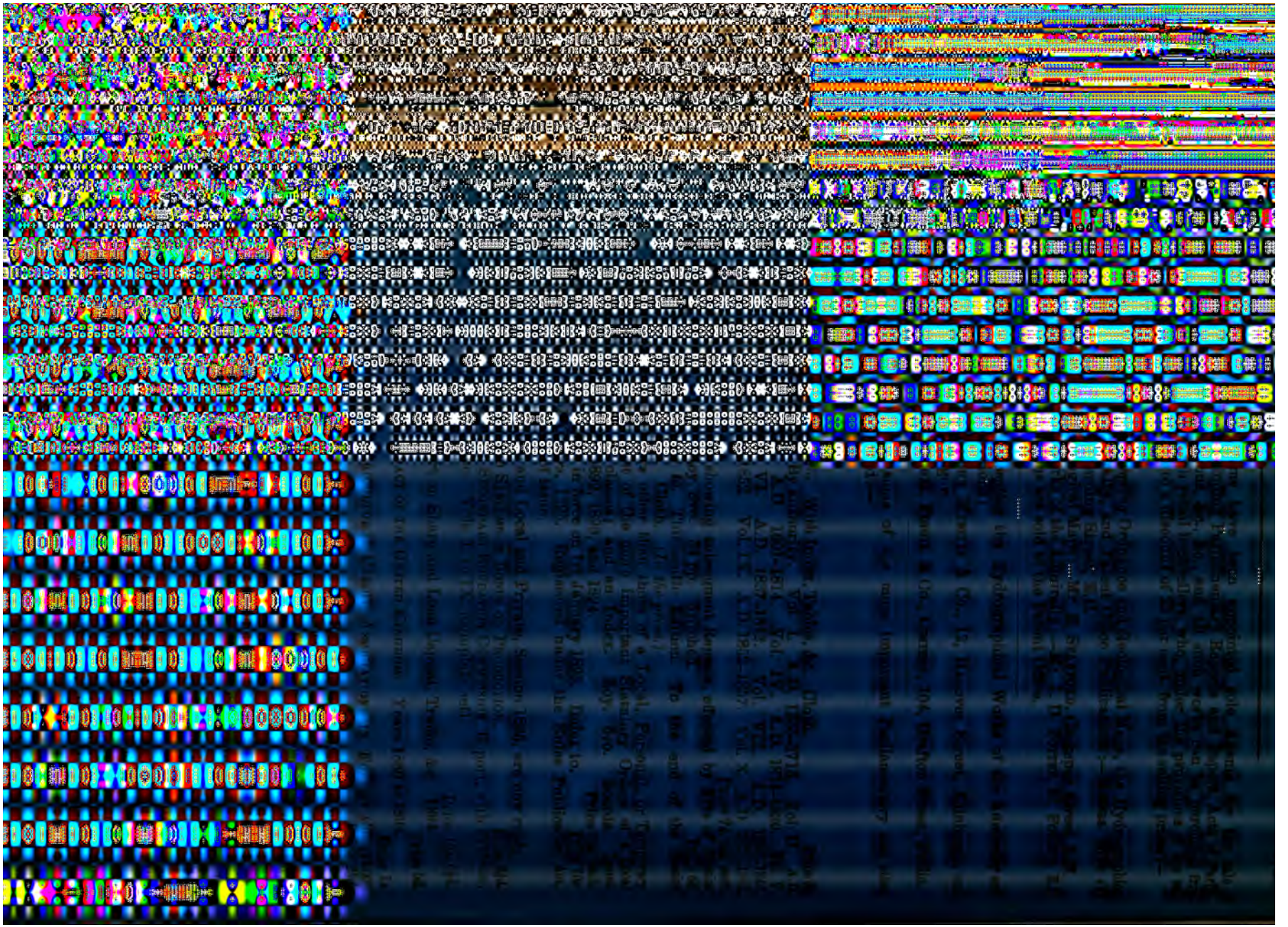

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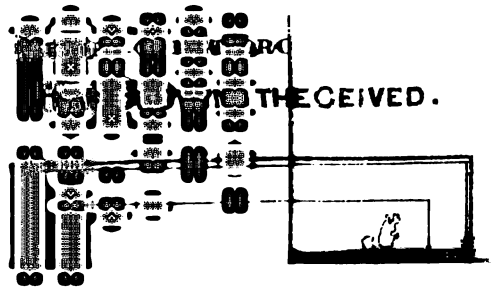
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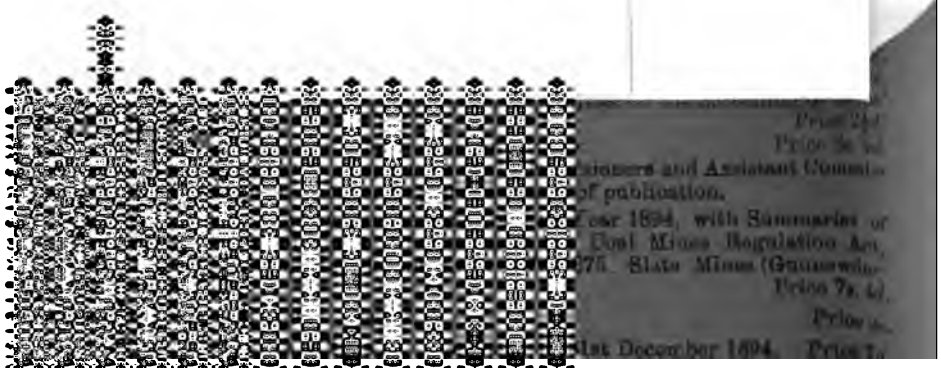

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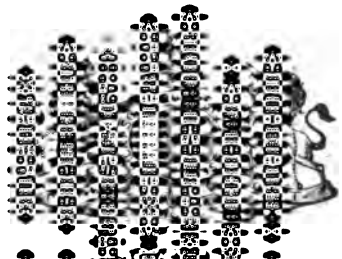

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THE METEOROLOGICAL COUNCIL,

1894–95.

Lieutenant-General RICHARD STRACHEY, R.E., C.S.I., LL.D., F.R.S., Chairman.

MR. ALEXANDER BUCHAN, M.A., LL.D., F.R.S.E.

Professor GEORGE HOWARD DARWIN, M.A., LL.D., D.Sc., F.R.S.

MR. FRANCIS GALTON, M.A., D.C.L., D.Sc., F.R.S.

MR. EDWARD J. STONE, M.A., F.R.S.

Rear-Admiral WILLIAM J. L. WHARTON, C.B., F.R.S., Hydrographer of the Admiralty.

MR. ROBERT H. SCOTT, M.A., F.R.S. (Secretary).

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REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1895.

Introductory.

THERE has been no change in the Council during the year. The executive officers are, as stated in the last Report:—

Mr. Scott, Secretary.
Nav.-Lieut. C. W. Baillie, R.N., F.R.A.S., Marine Superintendent.

The Report is, as usual, divided into four sections or parts:

I. OCEAN METEOROLOGY.
II. WEATHER TELEGRAPHY.
III. CLIMATOLOGY.
IV. MISCELLANEOUS.

PART I.

OCEAN METEOROLOGY.

Collection of information.

Collection of Information.—The practice followed by the Office in the collection of information has been to supply observers with a complete outfit of verified instruments, on the condition of their returning the instruments, and the log of observations made with them, to the Office at the completion of the voyage.

The instruments supplied are:—
One barometer; six thermometers, with a screen; four hydrometers.

The first record of observations is made in a rough book supplied for the purpose, which is retained by the Captain, who copies the observations into a regular form of log kept for the Office. As regards the Royal Navy, Her Majesty's ships are supplied by the Office with the meteorological instruments used in the Service, and the Council are glad to say that they receive meteorological logs of high value from this source.

In order to facilitate the communications between the Office and the observers, agencies are established at some of the principal ports, and instruments are supplied direct from them to the ships.

Collection of information.

The following is a list of the agents at present in connexion with the Office:—

Aberdeen, J. R. Jones, Navigation School.
Cardiff, T. L. Ainsley, Bute Docks.
Dundee, Capt. A. Wood, Navigation School.
Glasgow, Messrs. D. McGregor and Co., Clyde Place.
Greenock, Messrs. D. McGregor and Co., Brymner Street.
Hull, Z. Scaping, Trinity House.
Liverpool, J. Gill, Nautical College.
Southampton, Capt. D. Forbes, High Street.

Occasionally captains are supplied at ports where there are no agencies, and in these cases the instruments are sent direct from the Office in London. The number of merchant ships supplied with standard instruments and logs during the year was 90.

A set of instruments is kept in working order at the Office in London, and at each agency, for the purpose of instructing observers in the handling and reading of all the instruments. A notice to captains is frequently distributed to vessels lying in the various London docks, and copies of it are also supplied to each agent for circulation.

Various publications (see App. XVI., p. 122) are presented by the Council to observers who supply the Meteorological Office with thoroughly well kept logs, in recognition of their co-operation in a work which is calculated to be of very great advantage to navigators and to science generally.

Recognition of "excellent" observers.

Appendix I. (p. 36) contains a list of all the observers who during the past year have contributed logs classed as "excellent." Several of these observers have regularly co-operated with the Office for many years. The names which appear in the list for the first time are as follow:—

Observer's Name.	Ship.
Darby, H. G.	S.S. "Ormuz."
Dulling, G.	S.S. "Strathclyde."
Free, T., R.N.R.	S.S. "Port Chalmers."
Gibson, J. H.	S.S. "Wydale."
Gubbins, Lieut. G. W., R.N.	H.M.S. "Penguin."
McGregor, J.	S.S. "Glenartney."
Seaton, W. A., R.N.R.	S.S. "Thames."
Thomas, H. G.	S.S. "Yarrawonga."
Thorpe, V. G., (Surgeon)	H.M.S. "Penguin."
Walton, R.	S.S. "Port Victor."

The Council take this opportunity of expressing their best thanks to the observers who have assisted them during the past year.

They regret to have to announce the death of two of their observers, Capt. H. G. Darby, S.S. "Ormuz," and Capt. J. C. Long, S.S. "Japan," the latter of whom had been observing for the Office for seven years.

The total number of Meteorological logs received in the year ending March 31, 1895, was 127, of which 121, or 95 per cent., have been classed as either "excellent" or "very good." Character of logs received.

The Council continue to receive, through the Ocean Steamship Company of Liverpool, a considerable number of ships logs, mostly from voyages to and from the China Seas, viâ Suez.

Appendix II. (p. 38) gives a list of the meteorological logs from ships, received at the Office during the year.

The following list gives a summary of the voyages for each Ocean, made by the ships specified in this Appendix :— Districts from which observations are obtained.

North Atlantic -	388	Pacific Ocean, South -	56
South „ -	124	Mediterranean -	160
Indian Ocean -	211	Red Sea -	141
Pacific Ocean, North -	80	Arctic Ocean -	10

The following is an account of the works either published or in course of preparation in this branch of the Office during the year :— Publications

Red Sea Charts.—These charts are in the hands of the binders and will be issued immediately.

Current Charts for all Oceans.—Having collected all the information available from English and foreign sources, the work of obtaining generalised results is in progress, and the charts of the Indian Ocean are already well advanced.

The Meteorology of the South Sea.—The charts for this region, embracing the area from the Cape of Good Hope to New Zealand, and south of the latitude 30° S., are now almost completed, and will shortly be sent to the engraver.

The South Atlantic and West Coast of South America.—The preparation of logs and extraction of the data for this district is steadily advancing.

Supply of Instruments to Distant Stations.—In the course of the year the outfit of a complete meteorological station has been supplied to the Church Missionary Society for one of their settlements in Uganda. The Jackson-Harmsworth Arctic Expedition was also supplied with meteorological instruments suitable for use in the polar regions. Supply of instruments to distant stations.

Supply and Stock of Instruments.—In Appendix III. (p. 42) is given a list of the meteorological instruments supplied by the Office to ships in the Royal Navy during the year, with a statement for the 31st March 1895 of the stock and distribution of the instruments standing on the books to the account of the Admiralty. The recent augmentation of the number of ships in commission and in reserve has led to the necessity of providing a considerably larger stock of instruments than had been required in former years. Stock of instruments belonging to the Office.

Appendix IV. (p. 43) gives similar information with regard to the disposal of the other instruments belonging to the Office, remaining in store, or which have been supplied to the Mercantile Marine, and to observatories, telegraph stations, &c.

PART II.

Weather Telegraphy and Forecasts.

Administrative.

There have been no long continued interruptions of telegraphic communication during the year. At Christmas our reports from the northern and north-western districts were entirely stopped for three days, owing to the wholesale destruction of telegraph wires caused by the gale of December 22nd. Communication with Norway and Denmark was interrupted November 14th, 1894 and January 14th, 1895.

Among the observers there have been three changes. At Cambridge Miss A. Walker has replaced Mr. P. Morris, at Prawle Point Mr. T. Howse has replaced Mr. M. Holmes in command of the coastguard station and as reporter, and at Stornoway Mr. J. Mackenzie has been appointed in place of Mr. J. Forbes.

A list of the telegraphic reporting stations in the United Kingdom is given in Appendix XI (p. 84), and of the Foreign stations in Appendix XI. (p. 89).

The work in this branch of the Office has gone on as usual. The only addition to the list of reporting stations has been Karlstad on Lake Wener in the interior of Sweden.

Inspection of the Stations.

Inspection of the Telegraphic Reporting Stations.—The telegraphic reporting stations have been inspected during the year, in England by Messrs. F. Gaster and R. and J. Curtis, in Scotland by Mr. Buchan, and in Ireland and Wales by Mr. Scott. The reports submitted to the Council by the Inspectors, which are printed in Appendix V. (p. 44), show that the efficiency of the service has not been impaired. The stations in Foreign countries are controlled by the Meteorological authorities of the respective countries.

Discussion of the reports.

Discussion and Publication of the Information received.—The practice of the Office in collecting, discussing, and disseminating the meteorological information received by telegraph is described in Appendix X. of the Report for 1891. The Daily Weather Report has appeared regularly during the year; for details see that Appendix.

Distribution of reports.

It is distributed free of cost as follows:—To newspapers, seven copies; to seaports, for public exhibition, 71 copies; to Government offices and public institutions, 79 copies; to correspondents of the Office, 61 copies; and to foreign meteorological establishments, 35 copies. Nearly 200 copies are issued regularly to paying subscribers.

The Weekly Weather Report, with its Monthly Appendices, has also appeared regularly; for particulars of this publication see Appendix VI. (p. 72). Weekly Weather Report.

Public display at the Meteorological Office in London of the State of the Weather on British Coasts.—This arrangement, which was made with a view to the earliest possible supply to the public of the latest information as to the weather received from the principal points on the eastern, southern, and western coasts, has been regularly carried out, and it is believed with general public approval, to judge from the number of persons constantly found examining the maps and frames. It supplies at 9.30 a.m. and 3 p.m. every week day the substance of the reports received by telegraph, of the state of the weather and sea at the following stations: Yarmouth, Dungeness, the Needles (Hurst Castle), Scilly, Holyhead, and Valencia, and this is displayed in a conspicuous manner on the front of the Office, 63, Victoria Street, S.W. Display of information in front of the Office.

Supply of Forecasts to the Admiralty.—At the request of the Admiralty daily forecasts were supplied to the Commander-in-Chief, Devonport, as in previous years. Forecasts for the Admiralty.

Weather Forecasts.—Forecasts are prepared three times a day, namely, at 11 a.m., at 3.30 p.m., and 8.30 p.m. The Forecasts prepared at 11 a.m., on the information derived from the 8 a.m. reports, refer to the probable weather between noon on the day of issue and noon on the following day. They are publicly exhibited in several places in London,* and are supplied to the afternoon editions of the newspapers. The 3.30 p.m. Forecasts are employed for storm warnings only, excepting in the hay harvest season, when they are issued as subsequently explained. The forecasts at 8.30 p.m. are specially prepared for publication in the morning newspapers, but all the forecasts are available for the information of anyone who applies for them at the Office. Forecasts.

The inquiries received through the Post Office for special forecasts during the year amounted to 95, and the personal applications to 72. The rules of the Office relating to such inquiries are stated in Appendix VI., p. 75. Inquiries at the Office.

The results of a comparison of the Forecasts issued at 8.30 p.m. during the year, with the weather actually experienced, are given in Appendix VII. (p. 76). The following summary shows the successes and failures over the whole United Kingdom, estimated as explained in that Appendix. Results of Forecasts.

* Viz., in the City at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's, Cornhill, and Messrs. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and the House of Commons; at Messrs. Elliot's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and Messrs. Pastorelli's, New Bond Street; and at the Office, 63, Victoria Street.

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1894-95.

Districts.	Per-centages.				Total per-centage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	55	28	11	6	83
„ E. - -	56	25	14	5	81
ENGLAND, N.E. - -	59	25	12	4	84
„ E. - -	58	29	9	4	87
MIDLAND COUNTIES -	56	28	12	4	84
ENGLAND, S. - -	61	27	8	4	88
SCOTLAND, W. - -	49	29	14	8	78
ENGLAND, N.W. -	56	27	12	5	83
„ S.W. -	59	25	10	6	84
IRELAND, N. - - -	55	24	12	9	79
„ S. - -	52	29	13	6	81
Summary - -	56	27	12	6	83

* Note, "partial" implies "more than half."

Testing of Forecasts.

The following table shows for each year from 1885 to 1894 inclusive, the per-centages of complete and partial success of the Forecasts issued at 8.30 p.m. for the whole year. It will be seen that the total for "complete success" was highest in 1893, and that 1894 did not fall far short of its predecessor.

PER-CENTAGES of RESULTS of FORECASTS for the whole of the BRITISH ISLES.

Year.	Complete Success.	Partial, *i.e.*, more than Half Success.	Total Success.
1885 - -	50	34	84
1886 - -	49	31	80
1887 - -	52	32	84
1888 - -	51	31	82
1889 - -	49	32	81
1890 - -	50	32	82
1891 - -	50	30	80
1892 - -	46	33	79
1893 - -	59	25	84
1894 - -	56	27	83
Average - -	51·2	30·7	81·9

Hay Harvest Forecasts.

Hay Harvest Forecasts.—The Council renewed in 1894 the offer made in previous years to the Royal Agricultural Society, the

Royal Dublin Society, and the Highland and Agricultural Society to send Daily Forecasts *gratis* during the haymaking season to a number of observers selected by those Societies, on two conditions, viz., that the information should be made known as widely as possible, and a record of the weather actually experienced sent weekly to the Office. The Societies accepted the proposal, and the Forecasts were issued as shown in the following table:— Hay Harvest Forecasts.

LIST of those who received HAY HARVEST FORECASTS in 1894.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass	Golspie.
	Major Smith	Munlochy, Inverness.
1. SCOTLAND, E.	T. Wilson	Glamis Castle, by Forfar.
	C. Pirrie	Rothiemay, Huntly.
	T. Bett	Dalnaline, Aberfeldy.
2. ENGLAND, N.E.	Sir J. Wilson	Chillingham Barns, Chatton, Northumberland.
3. ENGLAND, E.	W. Birkbeck	High House, Thorpe, Norwich.
	Sir J. B. Lawes, Bt., and Sir J. H. Gilbert, Ph.D.	Rothamsted, Harpenden.
4. MIDLAND COUNTIES	Royal Agricultural College.	Cirencester.
	Major Fosbery	Warwick.
	T. H. Thursfield	Barrow, Broseley, Salop.
	E. E. Harcourt-Vernon	Grove Hall, East Retford.
	*J. Watson	Shirburn, Tetsworth, Watlington.
	*Rev. S. H. Williams	Newport Pagnell, Bucks.
5. ENGLAND, S.	C. Whitehead	Barming House, Maidstone.
	E. P. Squarey	The Moot, Downton, Wilts.
	M. J. Sutton	Kidmore Grange, Caversham.
	*T. Stirton	Stratton, Micheldever, Hants.
	*R. Webb	Beenham, Berks.
6. SCOTLAND, W.	W. Calder	Castle Hill, Dalreoch, Dumbarton.
	Sir M. J. Stewart, Bt., M.P.	Ardwell, Stranraer.
	J. S. R. Ballingal (the late).	Eallabus House, Islay.
7. ENGLAND, N.W.	G. W. Wray (the late)	Leyburn, Yorkshire.
8. ENGLAND, S.W.	The Earl of Ducie	Tortworth, Gloucestershire.
	T. Dyke	Long Ashton, Clifton, Bristol.
	R. Neville Grenville	Butleigh Court, Glastonbury.
9. IRELAND, N.	E. F. Farrell	Moynalty, Co. Meath.
	J. M. Wilson, J.P.	Currygrane, Edgeworthstown.
10. IRELAND, S.	D. A. Milward	Lavistown, Kilkenny.
	W. Talbot Crosbie, D.L.	Ardfert Abbey, Tralee, Co. Kerry.

* An asterisk is inserted against the names of those recipients who subscribed for the forecasts.

The telegrams were sent daily for the period of about five weeks commencing June 11th. In some cases, by special request, they were continued for the period of the corn harvest.

The general result of the issue of these forecasts, shown by the subjoined table, has been prepared solely from the reports of the above-mentioned gentlemen, and is entirely independent of any estimate formed within the Office itself:—

Hay Harvest Forecasts.

SUMMARY of RESULTS.—HAY HARVEST FORECASTS, 1894.

Districts.	Names of Stations.	Per-centages.				
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	Total per-centage of Success.
SCOTLAND, N.	Munlochy and Golspie	60	33	7	—	93
„ E.	Aberfeldy, Glamis, and Rothiemay	56	34	10	—	90
ENGLAND, N.E.	Chatton	67	24	9	—	91
„ E.	Rothamsted and Thorpe	64	30	6	—	94
MIDLAND COUNTIES	Cirencester, East Retford, Warwick, Broseley, Watlington, and Newport Pagnell.	67	25	8	—	92
ENGLAND, S.	Maidstone, Downton, Reading, Beenham, and Micheldever.	58	35	7	—	93
SCOTLAND, W.	Stranraer, Islay, and Dumbarton	56	32	12	—	88
ENGLAND, N.W.	Leyburn	53	37	10	—	90
„ S.W.	Tortworth, Clifton, and Glastonbury	65	23	11	1	88
IRELAND, N.	Moynalty and Edgeworthstown	68	15	11	6	83
„ S.	Tralee and Kilkenny	62	20	15	3	82
	Mean for all districts	61	28	10	1	89

These figures show that the forecasts for 1894 gave a total per-centage of 89, which may be considered very satisfactory as the weather was very unsettled at the season.

Forecasts to the Board of Agriculture.

Forecasts to Her Majesty's Board of Agriculture.—The Board of Agriculture extended their system of issuing these forecasts considerably as compared with the previous year. The Council are indebted to them for a Report on the service, from which the subjoined extracts have been made:—

"In the spring of 1894 the Board of Agriculture made arrangements, with the sanction of the Lords Commissioners of Her Majesty's Treasury, to repeat on a larger scale the experiments initiated in the previous year of exhibiting at telegraphic stations in rural districts every afternoon the daily weather forecasts issued by the Meteorological Council. The counties of Somerset, Carnarvon, Ayr, Cambridge, York (East Riding), and Haddington were selected for this experiment and arrangements were made that the forecasts should be despatched to the telegraph offices at such varying periods as would suit the agricultural conditions of the hay and corn harvest in the several counties. The period of exhibition was (in the case of each county) of eight weeks' duration. The forcasts were issued in the first instance to the county of Somerset on June 11th; a fortnight later (June 25th) forecasts were issued to Ayr and Carnarvon. Cambridge followed a week later, namely, July 2nd, while to York (East Riding) and Haddington the first forecast was despatched on July 23rd and August 16th respectively.

" The number of stations at which the forecasts were exhibited in Somerset was 106, in Ayr 54, in Carnarvon 32, in Cambridge 50, in York (East Riding) 47, and in Haddington 16. Forecasts to the Board of Agriculture.

" A form of 'Record of Weather,' similar to the form used by the Meteorological Office in connexion with the issue of the hay harvest forecasts, but having room for only one observation a day, was issued to observers, who were requested to record daily the hour at which the forecast was exhibited, the direction and force of the wind, and the general conditions of the weather, including 'temperature,' 'sky,' 'rainfall,' and 'storms.' A column was also reserved for recording the number of hours daily that work was suspended owing to rain."

The observations recorded in these forms were analysed and compared with the forecasts by the Board of Agriculture. There appears to have been some uncertainty in the minds of several of the reporters as regards the interval covered by the forecasts, and the results of the checking are not quite conclusive. An interesting report on the forecasts for the neighbourhood of Reading by Mr. H. N. Dickson to the Council of the University Extension College at Reading has been communicated to the Board of Agriculture, by whose permission the paper has been reprinted in this Report as Note A, p. 22.

The Council regret that the experiment thus made in 1894 is not to be repeated in the present year. It is apparent that the proper appreciation of the value of information, such as is given in the forecasts, can only be arrived at after somewhat continued experience, and that the best mode of framing and distributing the forecasts can only be satisfactorily determined by actual trial. In such a matter the fact that many persons after such experience attest the value of the information supplied, cannot be reasonably held to be controverted by the opinions of those who after a short trial have failed to recognise its utility. In this, as in many other directions, the public has to be educated, before knowledge presented in a form that is not familiar is appreciated at its true worth. The Council, therefore, trust that the subject may continue to receive the attention of the Board of Agriculture, which they are satisfied it deserves, in connexion with what is one of the most important industries of our country.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix VIII., p. 77, are given the names of the stations furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade, issued in February 1874. Storm Warnings.

These stations were, at the end of March 1895, 180 in number, situated :—

103 in England and Wales, 48 in Scotland, 23 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

A comparison has been made in the Office between the warnings issued during the year and the weather experienced on our coasts, the warnings being tested by the method explained in Appendix VI., p. 75. The results of this comparison are shown in the following tables :—

RETURN of the RESULT of the COMPARISON between the WARNINGS ISSUED and the WEATHER EXPERIENCED in 1894.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 and 7.	Warnings not justified by subsequent Weather.	Warnings late. Force 9 reached at two Stations before issue.	Warnings partially late. Force 9 reached at one Station before issue.	Storms for which no Warning was issued.
Scotland, N.E. -	42	28	9	2	—	3	Feb. 3, May 4, Dec. 26–27.
„ E. -	34	20	8	6	—	—	——
„ N.W. -	45	35	7	3	—	—	——
„ W. -	42	20	19	3	—	—	Dec. 18–19.
Ireland, S.W. -	39	30	7	—	2	—	April 24, Dec. 14–15, Dec. 18–19.
„ N.W. -	48	38	7	3	—	—	Dec. 18–19.
Irish Sea - -	41	35	5	—	—	1	Dec. 14–15, Dec. 18–19.
St. George's Channel	39	20	19	—	—	—	Dec. 18–19.
Bristol Channel -	36	27	7	1	1	—	Jan. 31, Dec. 18–19.
England, S.W. -	35	28	6	1	—	—	Jan. 31, Dec. 14–15, Dec. 18–19.
„ S. -	27	16	10	1	—	—	——
„ S.E. -	27	17	6	4	—	—	——
„ E. -	22	14	5	3	—	—	——
„ N.E. -	25	16	3	3	1	2	——
Totals - -	502	344	118	30	4	6	
Per-centages -	—	68·5	23·5	6·0	0·8	1·2	

NOTES as to GALES EXPERIENCED in 1894 but for which no WARNING was issued.

1. *January* 31*st*. *A North-Westerly Gale, in the Bristol Channel and on the Coasts of England S.W.*—The coasts of Ireland and the N.W. coasts of Great Britain were all duly warned; but the unexpected development of a secondary disturbance near Holyhead caused the gale to spread southwards down our south-western coasts.

2. *February* 3*rd*. *A Westerly Gale, in Scotland N.E.*—This gale had been duly warned for on our W. and N.W. coasts, but it extended further in a North-Easterly direction than was expected.

3. *April* 24*th*. *A Southerly Gale in Ireland S.W.*—At 6 p.m. on 23rd there was nothing in the chart to show that anything of the character of a deep depression was advancing from the Atlantic; next morning the disturbance had advanced too far for this district to be warned.

4. *May* 4*th*. *A North-Westerly Gale, in Scotland N.E.*—A small depression, lying between the Shetland Islands and Norway on the 3rd appeared to be moving away to the eastward, but at night it suddenly grew deeper and moved southwards. There was no indication of this change at 6 p.m. on the 3rd.

Storm warnings.

5 *December 14th and 15th. A Westerly Gale over the South-Western parts of our Islands and the Irish Sea.*—At 6 p.m, 14th, a depression lay off our north-western coasts, but was not of threatening intensity. In the night, however, a sudden increase of pressure on its Western side (*i.e.* over the Atlantic) increased the gradient over the districts named, and as a result the gales here mentioned were experienced. There was nothing in the observations to show that such a change was probable.

6. *December 18th and 19th. A Westerly Gale on all our W. and N.W. coasts.*—At 6 p.m. on the 17th it was evident that a depression was coming on from the Atlantic, and strong winds were forecasted. The system, however, proved to be more serious than was anticipated and at 8 a.m., 19th it was too late for warnings to be issued.

7. *December 26th–27th. North-Westerly Gales in Scotland N.E.*—A large deep depression was advancing over Northern Europe from the north-westward, causing gales in Norway. Our coasts did not appear to be threatened, all the northern reports were coming in late, and those from Sumburgh Head had not arrived for some time, owing to telegraphic interruption caused by the heavy gale of December 22nd. A secondary disturbance came rapidly towards the Shetlands without warning, and caused the gale referred to.

Had the Sumburgh Head reports been in promptly this gale would probably have been warned for, but it is one of a type which have defeated our efforts several times, and which will probably do so again unless we can obtain good information regularly from the Farö Islands.

Comparison of results for 1894 with previous years.

The following table contains a comparative statement of the storm warnings and their results in 1894, and in the nine preceding years. It will be seen that the total per-centage of warnings justified was nearly the same as in 1892, and the total justified by subsequent gales was the highest on record.

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
		p.c.	p.c.	p.c.	p.c.
1885	591	55·3	24·0	79·3	19·5
1886	542	55·3	26·9	82·2	15·9
1887	472	55·5	26·1	81·6	16·4
1888	539	55·3	28·6	83·9	14·3
1889	373	47·7	33·5	81·2	16·9
1890	525	61·0	25·5	86·5	9·3
1891	522	62·3	24·5	86·8	7·5
1892	488	59·4	31·2	90·6	6·8
1893	480	60·8	28·6	89·4	7·1
1894	502	68·5	23·5	92·0	6·0

Storm warnings.

The following diagrams Figs. 1 and 2, show the figures of the last two columns of the table in a graphical form :—

DIAGRAM showing the INCREASE in PER-CENTAGE of SUCCESSFUL WARNINGS issued in each Year from 1885–94.

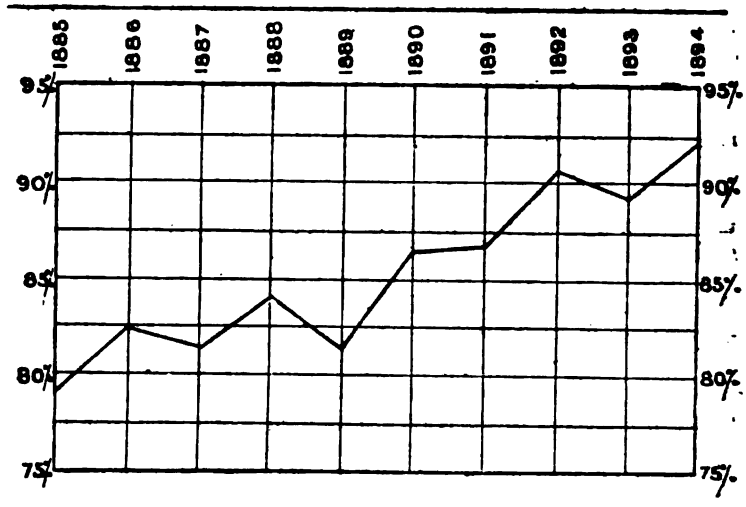


FIG. 1.

DIAGRAM showing the DECREASE in the PER-CENTAGE of UNNECESSARY WARNINGS issued in each of the Years 1885–94.

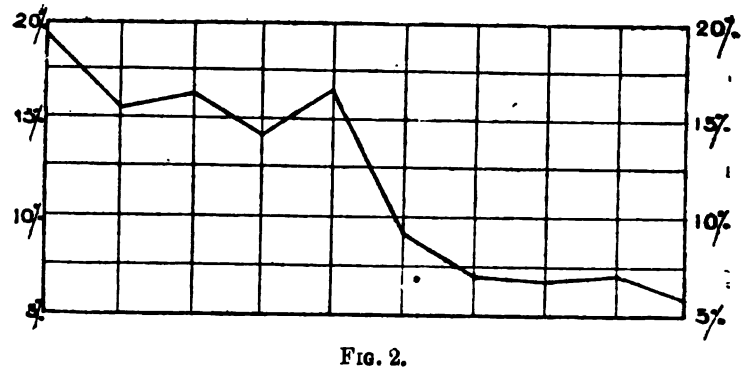


FIG. 2.

Fishery Barometers.

Fishery Barometers.—To add to the means available to the sea-going population for obtaining warnings of stormy weather barometers have for many years been supplied by the Office on loan to fishing villages and other places on the coast, to be set up for public information. The whole number of stations provided by the Office with these instruments is 203. Of these 64 are in England, 7 in Wales, 60 in Ireland, 67 in Scotland, 4 in the Isle of Man, and 1 in Jersey. The list is given in Appendix IX., p. 80.

PART III.

Climatology.

A.—British Isles.

Observations relating to the climate of the British Isles are received by the Office from 245 stations in all. These stations may be divided into seven classes, according to the kind and completeness of the observations supplied to the Office from them, as follows:—

Self-recording observatories.

1. *Observatories.*—Seven Observatories, furnishing a continuous record of pressure, temperature, wind, sunshine, and rainfall, with frequent eye observations of cloud and weather. At Fort William there is no anemometer, as the country is very hilly. These alone afford the materials necessary for the study of the periodic variations of the meteorological elements.

Anemographic Stations.

2. *Anemographic Stations.*—Nine Anemographic stations furnishing a continuous record of the wind. The records from these stations relate rather to weather as distinguished from climate, and are especially important in connexion with storms. They are often useful in affording evidence available in courts of law with respect to collisions at sea, and damage done by wind.

Barograph Stations.

3. *Barograph Stations.*—Stations furnishing a continuous record of pressure obtained from some form of self-recording aneroid. These are valuable as giving the exact time of the occurrence of pressure maxima and minima at certain stations, and thus helping to determine the rate of movement of the various depressions that cross these islands.

Sunshine Stations.

4. *Sunshine Stations.*—Forty-eight stations furnishing a continuous record of bright sunshine. At 47 of these stations, the instrument in use is the Campbell-Stokes recorder (*see* Report for 1879, p. 32); at the other station the Jordan photographic recorder is employed. A return of the daily duration of sunshine is also received from eight other stations.

Telegraphic Reporting Stations.

5. *Telegraphic Stations*—Thirty Telegraphic Reporting Stations, at which the observations are taken by eye, but supplemented in some cases by self-recording aneroids, &c. These supply the material upon which the daily weather reports and forecasts are based.

The hours of observation at these stations are determined by the requirements of the telegraphic system, as explained in Part II., but the data which they furnish are also utilized to afford climatological information for parts of the country where Stations of the Second Order do not exist.

Stations of Second Order.

6. *Second Order Stations.*—Seventy-four Stations of the Second Order, furnishing complete climatological information from eye observations taken twice a day. The observers at these stations are all volunteers.

Stations of the Third Order.

7. *Third Order Stations.*—Stations of the Third Order furnishing returns similar in kind to those in Class 6, but with less completeness and detail.

It must be explained that some of the stations are really of a higher class than would appear from the list in App. XI., p. 84, which is compiled solely with reference to the amount of the data supplied to this Office.

For instance at Liverpool (Bidston) and Oxford, there are regularly equipped meteorological observatories, though the stations appear only as telegraphic or Second Order stations in the list; and the same remark applies to other cases.

A fuller account of the methods employed by the Office in dealing with these records will be found in Appendix X. (p. 81).

List of Stations.

Appendix XI. (p. 84) contains a list of the stations furnishing information relating to the land meteorology of the British Isles during the year.

Inspection of stations.

Inspection of the Stations.—The self-recording observatories and the anemographic stations (Classes 1 and 2), as well as the Telegraphic Reporting Stations (Class 4), are regularly visited each year by the Inspectors of the Office. The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 6), some belong to the Royal Meteorological Society, and these are visited by an Inspector appointed by that Society, an allowance being made by the Office toward the cost of the inspection, in accordance with the recommendation of the Treasury Committee (1877). The remaining Stations of the Second Order, including those belonging to the Scottish Meteorological Society, are visited, most of them annually, by the Inspectors of the Office. The inspection of the self-recording observatories was carried on by Mr. Charles Chree, D.Sc., Superintendent of the Kew Observatory, and Messrs. T. W. Baker and E. G. Constable, his assistants.

Extracts from the reports of the Inspectors are given in Appendix V. p. 44.

Reports supplied to Registrar General for Ireland.

Information supplied to the General Register Office, Dublin.—Reports from the Irish stations of the Office have been regularly supplied to the Registrar General for Ireland, for his Weekly and Quarterly Returns.

Publications.

The Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office (see Appendix VI., p. 72), supplies, by its synchronous charts and Monthly Summaries, a very complete and instructive view of the chief meteorological changes, day by day, over the greater part of Europe, such as is believed not to be found in the similar publications issued by any other office.

Appendix I. to the Weekly Weather Report for 1894 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature for each district, for the 29 years 1866–1894, and also the Monthly and Progressive values of Accumulated Heat, Rainfall, and Bright Sunshine for all the districts in each month of 1894. Appendix II. to the same Report gives the Weekly and Progressive values for the same elements during the year 1894 (in continuation of Appendix II. for the year 1893).

Hourly Means of Meteorological Observations.—The Volumes of Hourly Means for 1891 and 1892 are now in the press. Hourly Means of Meteorological Observations.

The volume for 1891 contains, in addition to what has appeared in previous volumes, results for Fort William Observatory, and also hourly records of sunshine for all the observatories.

There is further a special appendix giving the results of the hourly tabulation of the sunshine recorded in the ten years 1881–90, at the seven observatories, as announced in last Report.

Observations at Stations of the Second Order.—The volume for 1890 is now issued, and that for 1891 is far advanced. Stations for publication.

As regards the detailed publication on Form A., the list of stations for 1891 is the same as that for 1890. With regard to the B. Stations (monthly means and summaries) the list has been increased by two, viz.,

St. Leonards—re-inserted—the evening observations having been resumed.

Arley Cottage, Mount Nugent, Co. Cavan.

B.—Foreign and Colonial Stations.

For a long time returns from various Foreign and Colonial stations have been received at the Meteorological Office, and in previous Reports a list of such documents has been given in the Appendix which contains the list of Logs received. Foreign and Colonial Stations.

During the year ending March 31st 1895, returns were received from 35 of these stations, as shown in Appendix XII, p. 90.

Most of these stations furnish observations taken twice daily, and the results are dealt with in the same way as those from Stations of the Second Order, as in Class 6 above. Continuous records of bright sunshine are received from Georgetown, British Guiana, and from Trinidad.

The results thus obtained are published from time to time when deemed of sufficient value. A paper has been prepared in the Office on the climate of Mojanga on the N.W. coast of Madagascar and published in the Quarterly Journal of the Royal Meteorological Society.

Besides this the meteorological tables published in the official Blue Book for the island of Cyprus have been prepared in this Office.

At the present time the observations from Cape Juby on the N.W. coast of Africa, and Georgetown, Demerara, are being discussed.

PART IV.

Miscellaneous.

Anemometer Experiments.—Experiments have been continued during the year with the Dines' pressure-tube anemometer, erected on the roof of the Office in Victoria Street, to test its indications. The Council erected a second instrument by the side of the first in order to make some comparative experiments as to the effect of varying the length of the tube, and contracting its bore, which Anemometer Experiments.

Anemometer Experiments.

it was considered desirable to test before arriving at a definite opinion concerning the merits of this instrument and the best form to give to it. The result of these experiments are given in Note B., p. 27.

Influence of Situation on Anemometrical Results.—During the very severe gale of December 22nd the indications of the two anemometers at Holyhead exhibited remarkable discrepancies, which were found to vary with the direction of the wind. These could only be due to differences in the exposures of the two instruments. A report on this subject by Mr. R. H. Curtis is given as Note C., p. 29.

Hourly Mean Values.

Hourly Mean Values of Pressure and Temperature.—The mean hourly values of these elements for the seven observatories for the 15 years 1869–1883, and for four of the observatories for the further period of seven years 1884–1890, are being grouped and combined ready for discussion preparatory to publication.

Rain Tables for the British Isles.

Rainfall Means for the British Islands.—This work is now in a very advanced stage, and it is hoped that it may appear before Christmas. The number of stations for which the monthly and annual values for the decade 1881–90 will be published in Part I. is as follows:—

England and Wales - - -	287
Scotland - - - -	152
Ireland - - - -	52

Part II., giving the values for the years prior to 1881, wherever obtainable, is almost ready, and Part III. giving the names of the authorities for the information and various other particulars, is being prepared.

Library, &c.

Library.

The library contains standard works on Meteorology and the allied Sciences, and is, besides, particularly rich in Transactions, Proceedings, Reports, and other Publications which give a large mass of Meteorological observational data from all parts of the world, extending over many years. It consists at present of about 13,000 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men, for reference at the Office.

Appendix XIII., p. 92, contains a list of the additions to the library during the year, which have been catalogued upon cards, and are entered in the reference catalogues under (1) Authors, and (2) Subjects.

List of Papers issued by the Office.

Appendix XV., p. 116, gives a list of all the papers, &c. on scientific subjects which have appeared in the various Reports issued by the Office since 1866.

Appendix XVI., p. 122, gives the usual catalogue of Office publications.

Expenditure.

Financial.

Appendix XIV., p. 115, shows the total receipts and payments of the Council during the year ending 31st March 1895. The amount voted by Parliament was 15,300*l.*, as in the previous year, in addition to which extra receipts from various sources amounting to 721*l.* 19*s.* 9*d.* also became available.

The following abstract of expenditure shows the amount properly chargeable against the Parliamentary grant of the year in question, and its distribution under the various heads, together with the increase or decrease in 1894–95 as compared with the previous year :—

Net Expenditure.	1893-94.	1894-95.	Increase.	Decrease.
General Administration:	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Payment of Council -	991 5 0	987 10 0	—	3 15 0
Secretary - -	800 0 0	800 0 0	—	—
Office - - -	903 18 8	891 6 9	—	12 11 11
Rent, fuel, and lighting -	703 7 1	717 2 2	13 15 1	—
Alterations to premises and contingencies -	387 13 1	291 8 10	—	96 4 3
Expenses incidental to International Meteorological Congress -	—	30 13 2	30 13 2	—
Pensions - -	186 16 4	159 3 3	—	27 13 1
Special Researches -	1,052 9 5	792 9 11	—	259 19 6
Land Meteorology -	3,657 2 3	3,594 16 4	—	62 5 11
Weather Information -	3,804 6 4	3,705 11 10	—	98 14 6
Inspections - -	589 6 7	436 16 5	—	152 10 2
Ocean Meteorology -	2,893 2 9	2,805 2 3	—	88 0 6
Total - - £	15,969 7 6	15,212 0 11	44 8 3	801 14 10

In the year 1894–95 the sum of 1,528*l.* 0*s.* 10*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires &c.

(Signed) R. Strachey,
Chairman.

NOTE A.

REPORT to the COUNCIL of the UNIVERSITY EXTENSION COLLEGE at READING on WEATHER FORECASTS during the HAY HARVEST of 1894, by H. N. DICKSON.

In connexion with the work of the Meteorological Department it was decided to distribute the special weather forecasts, issued by the Meteorological Office during the hay harvest, to four centres in different parts of the districts worked by the College. At each of the under-mentioned stations observers were found willing to undertake the keeping of a record by which to check the forecasts, and the public exhibition of the telegrams received:—

1. Newport Pagnell (Bucks), observer, Rev. S. H. Williams.
2. Shirburn (Oxon) „ John Watson, Esq.
3. Beenham (Berks) „ R. Webb, Esq.
4. Stratton (Hants) „ T. Stirton, Esq.

The forms sent out by the Meteorological Office have in each case been filled up and forwarded from week to week with the greatest care and promptitude, and the best thanks of the Department are due to the gentlemen who have carried out a somewhat irksome task so fully.

The four stations selected lie approximately on a straight line running S.S.W. and N.N.E. Stratton is situated on the north-western slope of the South Downs; Beenham, 20 miles to the N.N.E., in the Kennet Valley; Shirburn, 16 miles N.N.E. from Beenham, on the south-western slope of the Chilterns; and Newport Pagnell, 32 miles N.N.E. from Shirburn, on the River Ouse, north and west from the Chilterns. The first three stations are within the district called, by the Meteorological Office for forecasting purposes, "England, South," while Newport Pagnell is included in the "Midland Counties." The reports from the first-named district have been compared with the telegrams sent to Mr. Sutton at Reading, Mr. Sutton having kindly supplied the College with copies, while the Newport Pagnell reports have been compared with the forecasts received at that station.

The just estimation of the success or failure, in any given locality, of a forecast issued for a large district, is by no means the easy problem it is usually considered. It is obviously necessary to adopt a method capable of being reduced to figures, and any such method must be to a certain extent arbitrary, especially where both forecast and report must be couched in general terms. The method I have adopted is that of allotting to each forecast a certain number of marks, regarding it as a kind of examination paper. Dividing into the three headings of wind, weather, and rain, four marks are allowed under each for "complete success," three for "partial success," two or one for different degrees of

"partial failure," and none for "total failure." Thus for wind:—

Direction and force both right	=4
Direction right, force partly wrong	=3
Direction right, force wholly wrong	=2
Direction partly right (within eight points) force wholly wrong	=1
Direction and force both wholly wrong	=0

and similarly for the others. The following table shows the per-centage of available marks gained:—

—	Stratton.	Beenham.	Shirburn.	Newport Pagnell.
Wind	64	68	70	70
Weather	67	71	74	73
Rain	65	56	76	88
Means	65	65	73	77
		Total 70 per cent.		

To obtain an idea of the success or non-success of the work it is necessary to classify the forecasts according to the numbers obtaining a certain proportion of marks. The following table gives the number of forecasts which were awarded each number of the marks from 0 to 12; and as the question of rainfall is the most important for haymaking purposes, a special table is appended of the cases of marks (0 to 4) allotted to that element. The forecasts number 36 for each station, dating from 26th June to 5th August, exclusive of Mondays, no forecast being issued on Sunday.

WHOLE FORECAST.

Marks-	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	—
Beenham	—	—	—	2	1	5	3	7	5	3	4	5	1	36
Stratton	—	—	—	1	4	3	5	4	3	4	7	2	3	36
Shirburn	—	—	—	1	2	2	1	4	4	6	5	7	4	36
Newport Pagnell	—	—	—	—	—	2	1	5	3	7	7	6	5	36
	—	—	—	4	7	12	10	20	15	20	23	20	13	144

RAIN.

—	0.	1.	2.	3.	4.	—
Beenham	10	5	3	3	15	36
Stratton	6	1	10	3	16	36
Shirburn	4	2	4	4	22	36
Newport Pagnell	0	2	3	6	25	36
	20	10	20	16	78	144

For the whole forecast, we may group the 12 marks available as follows:—

0–3 Complete failure,
3–6 Partial failure,
7–9 Partial success,
10–12 Complete success,

and we get the following per-centages :—

——		Stratton.	Beenham.	Shirburn.	Newport Pagnell.
Complete failure -	0– 3	3	6	3	0
Partial failure -	3– 6	34	25	14	9
Partial success -	7– 9	29	41	39	42
Complete success -	10–12	34	28	44	49
Total failures -	0– 6	37	31	17	9
Total successes -	7–12	63	69	83	91

Similarly for rain :—

——		Stratton.	Beenham.	Shirburn.	Newport Pagnell.
Complete failure -	0	17	28	11	0
Partial failure -	1 and 2	30	22	17	13
Partial success -	3	8	8	11	17
Complete success -	4	45	42	61	70
Total failures -	0–2	47	50	28	13
Total successes -	3–4	53	50	72	87

The difficulties of weather forecasting, especially during summer, become at once abundantly evident. Newport Pagnell and Shirburn show excellent results, both for the forecasts as a whole and for rain, while the other two stations, especially in the matter of rain, are not encouraging. We may conclude that in the former case local influences did not produce so great modifications in the weather they seem to have done in the latter, and it is easy to bring this out by dividing up the period over which the forecasts extend. The following table gives the per-centage of possible marks obtained during each week of six days :—

WHOLE FORECAST.

——	Stratton.	Beenham.	Shirburn.	Newport Pagnell.
June 26—July 1 -	88	85	95	92
July 3— „ 8 -	59	54	72	70
„ 10— „ 15 -	63	74	68	71
„ 17— „ 22 -	56	54	77	84
„ 24— „ 29 -	61	61	50	67
„ 31—Aug. 5 -	63	56	78	82

RAIN.

—	Stratton.	Beenham.	Shirburn.	Newport Pagnell.
June 26—July 1 -	100	100	100	100
July 3— „ 8 -	42	46	63	63
„ 10— „ 15 -	71	84	79	96
„ 17— „ 22 -	55	21	84	88
„ 24— „ 29 -	67	55	46	88
„ 31—Aug. 5 -	59	29	88	92

During the six days June 26th to July 1, anticyclonic conditions prevailed over the whole area, and forecasting was comparatively easy: the marks obtained for the whole forecast ranged from 88 to 95 per cent., a few being lost, not from any fault in the telegrams, but from local influences affecting the light winds. In the matter of rain 100 per. cent. was scored in every case. From July 3 to July 8 conditions were much more complicated, an area of high pressure to the south changing its form and position in a manner which gave rise to great irregularities in the motions of low pressure systems to the north and west. This type of weather, with its local showers and thunderstorms, is notoriously the most difficult to forecast, and the per-centage of success at Shirburn and Newport Pagnell cannot be regarded as unsatisfactory in the present state of knowledge. The smaller per-centages at Beenham and Stratton are due to the fact that these stations from their situation frequently escape showers even when the weather favours their occurrence. The period July 10 to 15 was chiefly occupied by the slow passage of a depression up the English Channel, northwards into the North Sea, and finally north-westwards. The results are again very good, the loss of marks being chiefly due to unimportant discrepancies in the direction and force of the wind.

From 17th to 22nd July there was a recurrence of the complex distribution of pressure favouring the formation of secondary cyclones. Winds were in general west and south-west, but the rain area varied most irregularly. Shirburn and Newport Pagnell show remarkable success in the matter of rain (84 and 88 per cent.), while Stratton and especially Beenham break down hopelessly, the weather remaining fair when showers might reasonably have been expected. Easterly winds prevailed from July 21st to 29th, pressure being low in the south. It is remarkable that with the change of wind we find the per-centage of success at Stratton and Beenham higher, while at Shirburn and Newport Pagnell it is lower. The most marked failure of the whole period occurred on July 29th, when a heavy thunderstorm passed over the three southern stations.

From 31st July to 5th August winds were again westerly, depressions moving eastwards over the northern part of the British Isles. The greater part of the forecasting area was accordingly in the showery region to the right of the low pressure;

and we find as before that with westerly winds Shirburn and Newport Pagnell show a high per-centage, while Beenham, and to a certain extent Stratton, break down, simply through the fact that when showers might have been expected, none fell.

It is, of course, impossible to discuss the local meteorology of the four stations from the slender data afforded by six weeks' forecast reports. The results hinted at are sufficiently interesting. Stratton and Beenham are on the lee side of elevated ground when the winds are Westerly, and Shirburn and Newport Pagnell when they are Easterly. In these two cases the air passing over the stations is therefore no longer rising, and the probability of certain types of rain falling is accordingly reduced; and the chance is less, the less the intensity of the meteorological conditions favouring the fall of rain, for the local effects play a larger proportional part.

The following results are sufficiently clear from the foregoing:—

1. Detailed forecasting from a central office is impossible; and it is impossible to form a fair estimate of a general forecast from its success at a few isolated stations.

2. By establishing a net work of observing stations, even if the observations are of the simple nature required by the appended form, much important information might be obtained as to local peculiarities, and the results would greatly help in the interpretation of the forecast telegrams. The discussion of such observations seems a legitimate undertaking for the Department of the College.

3. The value of the forecasts would be greatly increased if the farmers received sufficient elementary instruction in meteorology to enable them to understand the general nature of the changes predicted.

At the close of their work the four observers were kind enough to furnish reports on the interest taken in the forecasts in their respective districts, and the general impression produced by them.

NOTE B.

REPORT on the COMPARISONS made between two PRESSURE-TUBE ANEMOMETERS on the Roof of the METEOROLOGICAL OFFICE, by Mr. R. H. CURTIS.

In the Report for last year it was intimated that the Council intended to erect a second pressure-tube anemometer by the side of the one already set up on the roof of the Meteorological Office, in order to make a series of comparisons between them. This was done in May 1894, the second instrument being placed at a distance of 6 feet to the south of the first, and having its vane at a height of 25 ft. 3 ins. above the roof, instead of 24 ft., which was the height of the vane of the other instrument.

Since its erection several series of experiments have been made, which have been chiefly directed to the elucidation of the two following points:—

1. What amount of agreement might be looked for in the indications of two instruments erected under similar conditions as to exposure, and length of tube connecting the "head" with the recording apparatus, but otherwise quite independent of each other.

2. To what extent would the indications of two instruments be affected by—

   (*a.*) Variations in the length of the tube connecting the head with the recording apparatus.

   (*b.*) Contraction of the bore of the connecting tube.

As regards the first point, the results of the comparisons were wholly satisfactory. It was found that two instruments similarly exposed, but in all respects independent of each other, gave practically identical results, the traces yielded by the two instruments being almost perfect fac-similes of each other under every variety of wind-force. This was satisfactory, inasmuch as it showed that the method of manufacture allowed of the float, which is the essential part of the instrument, being made with great accuracy; and that therefore the indications of different instruments might be confidently compared with each other.

As to the second point, the effect of altering the length of tube connecting the vane or "head," with the float was first tested by inserting an extra length of 25 feet in both the pressure and the exhaust tubes of the second instrument, making in each a total length of 95 feet, instead of 70 feet as in the original instrument. The effect was quite inappreciable, and the traces yielded by the two instruments continued to resemble each other as closely as before, not only in their general appearance but also as regards their record of isolated and transient gusts.

The length of the tubes was therefore further increased by inserting an additional 100 feet, making in all 195 feet as against 70 feet. The damping effect of this increase at once became apparent in the trace in the elimination of the smaller and very

transient oscillations of the float, which are constantly taking place when the wind is blowing with at least moderate strength, but which do not last sufficiently long to make themselves felt through so great a length of tube. The main features of the trace were, however, still retained, and all the important variations in the wind-force, including all gusts and lulls which lasted for two or three seconds, and which almost invariably included the maximum and minimum, were similarly registered by both instruments. The damping thus effected had indeed this advantage, that it brought into even greater prominence the larger variations of wind-force, some of which cover a period of twenty minutes or half an hour, through the elimination of the very small oscillations by which to some extent they are oftentimes masked, especially in very gusty winds.

The practical deduction from these experiments appears to be that a very considerable variation is allowable in the length of tube which may be employed, without detriment to the record, in the erection of an instrument. It is no doubt advisable to keep the length as nearly as possible the same in all instruments, and from 50 feet to 100 feet is suggested as the limits which may most usefully be adopted, but if the exigencies of the case require that a greater length should be employed, it would appear that no material "damping" need be feared by the use of another 50 feet. If more than 150 feet of tube is necessary it would probably be advisable to use tubes of slightly larger diameter, say five-eighths of an inch, instead of half an inch.

The effect of contracting the bore of the tube was tested by means of a series of metal discs, one of which could be fixed in the pressure tube at its junction with the recording cylinder. Each disc was a tenth of an inch thick, and had a hole bored through its centre, the holes varying from 0·30 in. to 0·02 in. in diameter.

It was found that so long as the diameter of the hole in the disc was not less than 0·06 in. the effect upon the trace was insignificant. When, however, it was reduced to 0·04 in. the motion of the float became greatly retarded. The smaller alternations in the wind-force became entirely eliminated, and many of the larger gusts and lulls were cut off also, whilst the maximum and minimum were never registered. The trace obtained was merely a generalised record of the wind-force, in which only those variations exhibiting considerable persistence were recorded. By still further reducing the aperture in the disc to 0·02 in. this sluggishness became much greater, and the trace was reduced to little more than a record of the mean force, from which very little information as to the character of the wind could be obtained. By increasing the length of the contracted passage, which was done by substituting a piece of glass tube for the metal disc, the "damping" effect for a given diameter was greatly increased.

This is, of course, what might have been anticipated, remembering that every movement of the float necessitates the passage into or out of it, according as it rises or falls, of a volume of air proportional to the extent of the movement.

NOTE C.

NOTE on the EXPOSURE of the ROBINSON ANEMOMETER at HOLYHEAD, by Mr. R. H. CURTIS.

The question of the effect of the exposure of anemometers on their indications has, in various forms, been long under consideration, but as regards the anemometer at Holyhead it was brought prominently forward by the violent gale of December 22nd, 1894.

This gale was one of unusual severity, and the wind velocities recorded at some of the anemometer stations in various parts of the kingdom were higher than had ever been recorded before; yet at Holyhead, where, from the damage done to shipping and from other evidence, the full force of the gale appears to have been felt, the velocity recorded by the Robinson anemometer only reached the comparatively moderate maximum of 71 miles in 60 consecutive minutes.

The anemometer is erected on the top of the lighthouse which stands at the entrance to the Old Harbour, and the fact that this building, which is a stone tower, 48 feet high, rising from the pier, is surrounded at its base by some large railway sheds, suggested the probability of local obstruction of the wind currents having been the cause of the low anemometer record; fortunately data were available for testing, at least to some extent, the truth of this supposition.

As will be seen from the plan and section accompanying, (Figs., pp. 30, 31) the lighthouse stands at the eastern end of the old pier, which runs from W. to E. for about 360 yards, whilst a wooden jetty extends beyond the lighthouse, but in a direction slightly to the north of east, for a further distance of 170 yards. The cups of the anemometer are 53 feet above the level of the pier, and 30 feet above the roofs of the sheds. The pier itself is 6 feet above the level of high water, and 23 feet above that of low water, at spring tides; and whilst its southern face is vertical the northern slopes upwards from the sea, and rises to a height of 10 feet above the general level of the pier.

It is therefore evident that the pier must, under ordinary conditions, form a very considerable obstacle to the wind, especially when it blows from any southerly and westerly point, in addition to which there is the further obstruction caused by the range of sheds, and by the tower itself.

At a distance of rather less than a third of a mile, in a straight line, from the lighthouse is the bridled anemometer designed by Sir G. G. Stokes, F.R.S., a description of which will be found in the Report for 1889. It is erected above the roof of a hut which stands on the western side of Salt Island, where it has a perfectly free exposure to the New Harbour and the sea from west through

north to east; to the south-east and south the exposure, though not quite so good, is still fair; whilst to the south-west lies the town of Holyhead, the nearest part of which, consisting of small houses, is quite 350 yards away. The cups of the instrument are about 15 feet above the ground, and although they are at a lower level than the cups of the Robinson instrument, yet, owing to the remoteness of anything likely to obstruct the wind, they, without doubt, possess a very much better exposure.

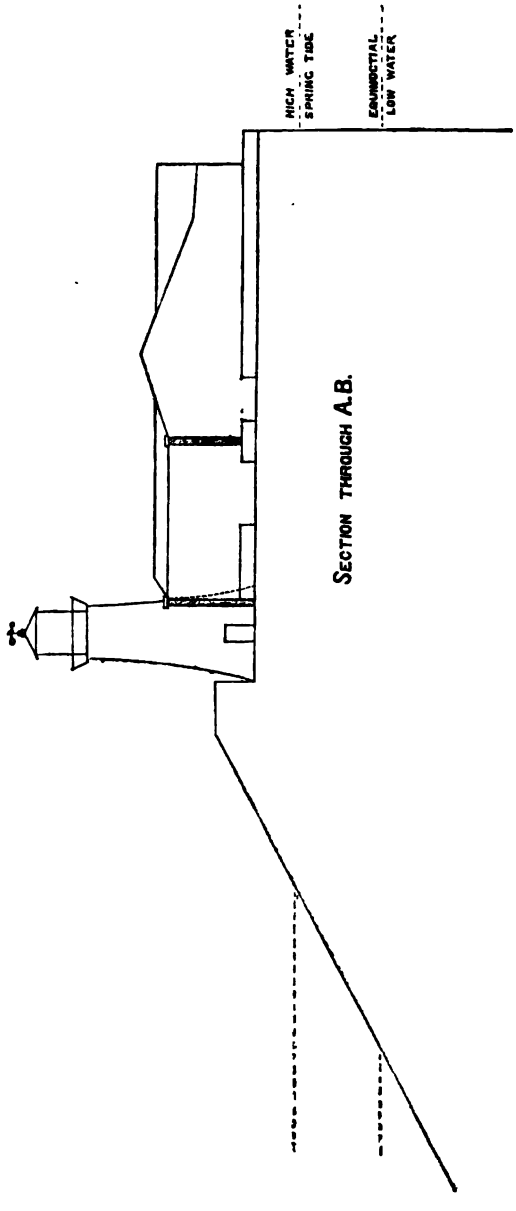


FIG. 3.
SECTIONAL ELEVATION OF JETTY AND LIGHTHOUSE.

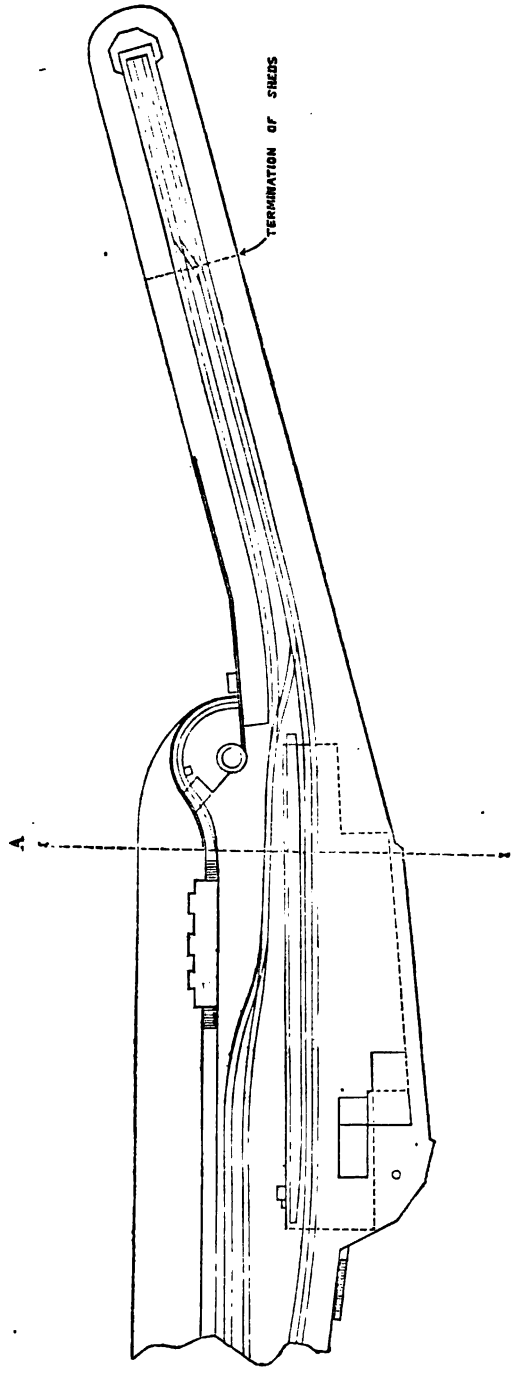


FIG. 4.

PLAN OF MAIL STEAM SHIP JETTY, HOLYHEAD.

It should be mentioned that at the time of the gale both these instruments were in excellent working order, each having only a short time before been thoroughly overhauled and cleaned.

The record yielded by the bridled anemometer, unlike that of the Robinson instrument, showed the gale to have been at Holyhead one of exceptional violence, and in this respect it confirmed the evidence obtained from other sources, and agreed with the anemometrical record obtained from Fleetwood and elsewhere.

It was therefore determined to compare all the available Robinson and bridled records in order to see whether, upon the assumption that the bridled instrument gave a correct record of wind-force, the result would confirm the supposition that the Robinson records were affected by the position of the instrument.

Assuming this supposition to be correct, the amount of difference between the two records might be expected to show—

(1.) A direct relation to the *force* of the wind.

(2.) Some dependence upon the *direction* of the wind, since the obstructions around the base of the tower are distributed somewhat irregularly.

Some alterations having been made in the bridled instrument in September 1894 it was not thought advisable to use the records prior to that date, but hourly measurements were made of all the subsequent curves, and the differences obtained between them and the corresponding measurements of the Robinson indications; the velocities of the latter instrument having been computed with the factor 2·2 instead of 3·0, in order to make them comparable.

These differences were first of all grouped according to the velocity of the wind from which they were obtained, *i.e.*, all those got from velocities of from 26 to 35 miles per hour were put together under 30, those from 36 to 45 miles under 40, and so on. The results are shown in the following table:—

TABLE I.

Velocities from which Mean was obtained.	No. of Observations.	Mean Velocity by		Difference. R.–B.	Per-centage of Difference to Mean Velocity by Bridled Instrument.
		Robinson Instrument.	Bridled Instrument.		
		Miles.	Miles.	Miles.	Per cent.
26–35 miles	808	25·4	30·1	– 4·7	15·6
36–45 „	284	31·3	39·7	– 8·4	21·2
46–55 „	106	37·5	49·2	–11·7	23·8
56–65 „	30	40·9	58·9	–18·0	30·6
Above 66 miles	12	44·9	71·0	–26·1	36·8

The bridled anemometer does not record lower velocities than 20 miles per hour, and when the pen of the instrument is near its inferior limit its action is doubtful, and there is always a liability for the readings to be too high. It has therefore been thought right in the above comparison to omit all readings below 25 miles per hour.

The increase in the per-centage with increase of force shown in the last column of this table is very striking, and, so far as it goes, entirely confirms the supposition as to the effect of the surroundings of the tower; but in this grouping no account was taken of the direction of the wind, and therefore, to test the effect of this, the differences were re-arranged under eight points of the compass, but this time without reference to the force of the wind. The results are shown in Table II.

TABLE II.

Direction of Wind.	No. of Observations.	Mean Velocity by		Difference R.—B.	Per-centage of Difference to Mean Velocity by Bridled Instrument.
		Robinson Instrument.	Bridled Instrument.		
		Miles.	Miles.	Miles.	Per cent.
North - -	247	29·6	34·8	− 5·2	14·9
N.E. - -	153	28·4	31·6	− 3·2	10·1
East - -	127	25·9	30·4	− 4·5	14·8
S.E. - -	45	29·0	31·6	− 2·6	8·2
South - -	247	29·0	32·4	− 3·4	10·5
S.W. - -	146	26·5	35·8	− 9·3	26·0
West - - -	113	23·8	39·0	−15·2	39·0
N.W. - -	162	31·6	43·9	−12·3	28·0

This table brings out clearly the fact that the amount of difference between the two instruments depends very much upon the direction from which the wind is blowing and not alone upon its force. It is worth noting, however, that the largest divergence between the two records is experienced, not when the wind is blowing at a right angle to the run of the pier and of the sheds, but when it is blowing from the westward, or along its length, suggesting that possibly the sheds form a large ventiduct into which the wind is sucked, and drawn *down*, away from the cups. Still assuming that the bridled instrument gives the true force of the wind, the figures given in the table appear to show that the Robinson record is affected with all winds, but more particularly when they blow from between South-west and North-west.

The differences were now once more re-arranged in a manner that should show how much of the difference is due to the direction and how much to the force of the wind:—

TABLE III.

—	North.	N.E.	East.	S.E.	South.	S.W.	West.	N.W.
Mean velocity by—Robinson	25·1	27·2	25·1	26·2	27·6	23·6	17·7	19·4
Bridled	30·0	30·2	29·7	30·7	30·2	29·7	30·4	31·0
Difference, R.—B.	−4·9	−3·0	−4·6	−2·5	−2·6	−6·1	−12·7	−11·6
Per-centage of difference to Bridled.	16·3	9·9	15·5	8·1	8·6	20·5	41·8	37·4
No. of observations	146	129	116	40	204	90	54	29
Mean velocity by—Robinson	35·2	34·7	34·2	35·2	33·3	28·8	24·0	28·1
Bridled	40·0	38·6	37·4	39·2	39·2	40·6	39·7	40·1
Difference, R.—B.	−4·8	−3·9	−3·2	−4·0	−5·9	−11·8	−15·7	−12·0
Per-centage	12·0	10·1	8·6	10·2	15·1	29·1	39·5	29·9
No. of observations	82	23	11	5	32	35	32	64
Mean velocity by—Robinson	40·4	40·0	—	—	41·6	33·0	31·2	38·6
Bridled	48·6	46·0	—	—	47·4	49·6	49·2	49·7
Difference, R.—B.	−8·2	−6·0	—	—	−5·8	−16·6	−18·0	−11·1
Per-centage	16·9	13·0	—	—	12·2	33·5	36·6	22·3
No. of observations	18	1		—	8	13	14	52
Mean velocity by—Robinson	45·0	—	—	—	44·0	37·8	38·9	43·2
Bridled	59·0	—	—	—	60·0	58·5	57·9	59·8
Difference, R.—B.	−14·0	—	—	—	−16·0	−20·7	−19·0	−16·6
Per-centage	23·7	—	—	—	26·7	35·4	32·8	27·8
No. of observations	1	—	—	—	1	6	9	13
Mean velocity by—Robinson	—	—	—	—	41·5	43·0	45·8	46·8
Bridled	—	—	—	—	69·5	68·0	72·0	72·3
Difference, R.—B.	—	—	—	—	−28·0	−25·0	−26·2	−25·5
Per-centage	—	—	—	—	40·3	36·8	36·4	35·3
No. of observations	—	—	—	—	2	2	4	4

The fact brought out here that generally the difference increases with the increase of velocity quite justifies the conclusion that the mass of the pier, with the lighthouse tower, and the buildings surrounding it, together form an obstacle sufficient to cause a great deflection of the wind away from the cups of the anemometer, whilst the further fact, again shown in this table, that the defect of the Robinson instrument is largely increased when the wind gets sufficiently to the westward as to allow it to blow *through* the sheds, in the line of their length, greatly supports the suggestion already made that the air is under those circumstances sucked into the sheds as into a large conduit, and with sufficient strength to seriously modify the action of the cups.

Taking these results as a whole there appears to be no room for doubt that—

(1.) The record yielded by the Robinson instrument is materially affected by the various obstructions to the wind which

surround the tower on which it is placed and possibly also by the tower itself.

(2.) That the Robinson record is always too low, but that the amount of its defect depends both upon the direction and the force of the wind.

(3.) That with strong winds blowing from between S.W. and N.W. the velocity of the wind as shown by the Robinson instrument may amount to only about two-thirds of the true velocity.

After these conclusions had been obtained they were tested by the following comparison, which appears to supply a further confirmation of them. During the gale of December 22nd, to which reference has already been made, a very high velocity was recorded at Fleetwood, where the Robinson anemometer is well exposed not far from the seashore ; the mileage recorded was indeed the highest ever registered in the British Islands in 60 consecutive minutes, being no less than 107 miles, as compared with 71 miles by the Robinson instrument at Holyhead ; yet from various considerations it seemed pretty certain that the gale must have been equally severe at both places.

But if the corrections indicated by the above tables are applied to the Holyhead record the discrepancy at once disappears, and a remarkably close agreement is obtained between the two Robinson records, and also the bridled anemometer record, as will be seen from the following table :—

TABLE IV.

	Maximum.			Mean.		
	Recorded Movement in One Hour.	Corrected to Factor 2·2.	Corrected for Exposure.	Velocity during Gale 22 Hours.	Corrected to Factor 2·2.	Corrected for Exposure.
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
Fleetwood -	107	78	78	79	58	58
Holyhead -	71	52	78	57	42	60
„ bridled	—	—	79	—	—	59

Without seeking to emphasise too much the very close agreement shown here, which, remembering the distance apart of the two stations, may be to some extent fortuitous, it is yet evident that it affords very strong support to the conclusions stated above.

APPENDIX.

APPENDIX I.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1895. The figures opposite to each show the total number of such Logs which they have returned to the Office during the period that they have been observing.

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Alford, F. - - -	2	S S. "Monarch."
Andersen, O. E. - -	12	S.S. "Longhirst."
Angus, T. S. - - -	11	S.S. "Ballaarat."
Atkinson, G. W. - -	10	S.S. "Ganges" and S.S. "Valetta."
Balfour, Comr. A. F., R.N. -	25	H.M.S. "Penguin."
Blackburne, H. S. - -	13	S.S. "Malwa."
Bolton, S. H. - - -	18	S.S. "El Dorado."
Bright, H. - - -	9	Barque "Beltana."
Cameron, J. G., R.N.R. -	11	S.S. "Teutonic."
Campbell, J. - - -	10	"Balmoral."
Chesshire, G. H. - -	3	S.S. "Aldgate."
Cromarty, D. S. - -	6	"Cambuskenneth."
Crowley, C. - - -	9	"Verajean."
Darby, H. G. - - -	2	S.S. "Ormuz."
Davidson, D. C. - -	2	Barque "Loch Rannoch."
De Horne, M. - -	5	S.S. "Carthage."
Docherty, H. - - -	6	Barque "Tinto Hill."
Dulling, G. - - -	1	S.S. "Strathclyde."
Dyke, H. W. - - -	11	Barque "General Roberts."
Elliott, Mr. C. - -	4	S.S. "Wilcannia."
Elliott, W., R.N.R. - -	8	S.S. "Clan Murray."
England, T. - - -	15	Barque "Glen Grant."
Exham, T. K., F.R.A.S. -	16	S.S. "Elbe" and S.S. "Tamar."
Field, Comr. A. M., R.N. -	15	H.M.S. "Egeria."
Free, T., R.N.R. - - -	1	S.S. "Port Chalmers."
Gibson, J. H. - - -	1	S.S. "Wydale."
Gubbins, Lieut. G. W., R.N. -	1	H.M.S. "Penguin."
Hepworth, M. W. C., R.N.R. -	13	S.S. "Port Albert" and S.S. "Port Victor."
Kemp, A. H. - - -	7	Barque "Hudson."
McGregor, J. - - -	1	S.S. "Glenartney."
Millican, J. W. - -	9	S.S. "Loughrigg Holme."
Milne, W. F. - - -	11	S.S. "Eclipse."

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Milner, W. H.	19	S.S. "Pará."
Murdoch, Peter	15	"Sierra Lucena."
Norman, F.	8	"Milton Stuart."
Peebles, R.	17	Barque "Carradale."
Pentin, W.	4	S.S. "Wilcannia."
Price, J. H.	8	"Othello."
Purey-Cust, Comr. H. E.	3	H.M.S. "Dart."
Randall, W.	15	"Laomene."
Rosseter, W. L.	17	"Sheila."
Sargent, A. H.	8	"Pleione."
Scott, G. P., F.R.Met.Soc.	12	Barque "Crompton."
Seaton, W. A., R.N.R.	1	S.S. "Thames."
Simpson, Alexander	18	S.S. "Thermopylæ."
—— Alexander	24	S.S. "Traveller."
Smith, J.	4	S.S. "Dunera."
Spalding, T. F.	7	S.S. "Australasian."
Streater, R.	5	"Euterpe."
Thomas, H. G.	2	S.S. "Yarrawonga."
Thorpe, V. G. (Surgeon)	1	H.M.S. "Penguin."
Trott, S., F.R.Met.Soc.	28	S.S. "Minia."
Walker, H., R.N.R.	19	S.S. "Etruria."
Walton, R.	1	S.S. "Port Victor."
Wilson, J., R.N.R.	12	S.S. "Ethiopia."

APPENDIX II.

List of Documents received from Ships.

Captain's Name.	Ship.	Voyage.	Year.
[1] Adamson, A. W.	S.S. Victoria	Australia, viâ Suez	1894
[2] Alford, E.	H.M.T.S. Monarch	Off British Isles	1893-94
Alsop, J. J.	Barque Brussels	New Zealand	1894
Andersen, O. E.	S.S. Longhirst	Continental Ports	1894
" "	"	Quebec, Gibraltar and Fiume	1894-95
[3] Angus, T. S.	S.S. Ballaarat	Australia, viâ Suez	1894
[3] " "	"	" "	1894
[3] " "	"	" "	1894-95
Asquith, W.	S.S. Bellerophon	Batavia, viâ Suez	1892
[4] Atkinson, G. W.	S.S. Ganges	China, viâ Suez	1894
[5] " "	S.S. Valetta	Australia, viâ Suez	1894
[6] Balfour, Comr. A. F., R.N.	H.M.S. Penguin	At China and Australia Stations	1893-94
[7] Barker, D. W.	School Ship Worcester	Off Greenhithe, Kent	1894
Barr	S.S. Orestes	China, viâ Suez	1891-92
Barwise, J.	S.S. Sarpedon	Java, viâ Suez	1891-92
Batt, H. E.	S.S. Hector	" "	1891-92
Bell, C. H.	S.S. Laconia	Odessa	1894
Blackburne, H. S.	S.S. Malwa	Bombay to China	1893
Bolton, S. H.	S.S. El Dorado	Continental Ports	1893-94
" "	"	"	1894-95
Boyd, James	Barque Brodick Bay	Mauritius	1893-94
[8] Brabender, H.	Barque Selkirkshire	New York, Sydney and Antwerp	1893-94
[9] Brander, J.	S.S. Magdalena	East Coast of S. America	1894
Bright, H.	Barque Beltana	Adelaide	1894-95
Brown, R. J.	S.S. Titan	China, viâ Suez	1891-92
[10] Bulkeley, Sir R. W. Bt.	Steam yacht Speranza	Mediterranean	1894
[11] Burgess, Arthur, R.N.R.	S.S. Bungaree	Australia, viâ Cape, Bombay, and home viâ Suez.	1894
[12] Cameron, J. G., R.N.R.	R.M.S. Teutonic	New York	1894
Campbell, James	Balmoral	Philadelphia, Calcutta	1893-94
[13] Cheshire, G. H.	S.S. Aldgate	Bombay, viâ Suez	1894
[14] Clunie, James	S.S. Transvaal	India, viâ Cape Town, and home, viâ Suez.	1893-94
[15] Conby, H. B.	Garfield	San Francisco	1893-94
Cook, Thomas J.	Oronsay	Melbourne	1894
Cromarty, D. S.	Cambuskenneth	Rio Janeiro, Newcastle (N.S.W.) and Portland (Or.).	1893-94
Crowley, C.	Verajean	New York and Shanghai	1893-94
" "	"	Shanghai to Vancouver and Alexandria.	1894-95
[16] Darby, H. G.	S.S. Ormuz	Sydney, viâ Suez	1894
" "	"	Australia, viâ Suez	1894-95
[17] Davidson, D. C.	Barque Loch Rannoch	Melbourne	1893-94
Davis, G. W.	S.S. Alberta	China, viâ Suez, and Australia, viâ Suez.	1893-95
" "	"	Bombay, viâ Suez	1894
[18] " "	"	Calcutta, via Suez	1894-95
Day, Robert	S.S. Achilles	China, viâ Suez	1890-92
[19] De Horne, M.	S.S. Carthage	Bombay, viâ Suez	1894
[19] " "	"	" "	1894
[19] " "	"	" "	1895
Dickens, E. G.	S.S. Diomed	China, viâ Suez	1891-92
[20] Dickinson, L. R.	R.M.S. Medway	West Indies	1894
Docherty, Hugh	Barque Tinto Hill	Monte Video and Melbourne	1894-95
[21] Dulling, George	S.S. Strathclyde	Colombo, viâ Suez, Madras and Perim.	1894
[21] " "	"	Calcutta, viâ Suez	1894-95
Dyke, H. W.	Barque General Roberts	San Francisco	1893-94

Captain's Name.	Ship.	Voyage.	Year.
Elliott, Wm., R.N.R.	S.S. Clan Murray	Cape Town, &c., Galle, Madras, and home, viâ Suez.	1894
,, ,,	,, ,,	Calcutta, via Suez	1894
England, Thomas	Barque Glen Grant	Apalachicola	1893–94
[22] Exham, T. K.	S.S. Tamar	Brazil	1893–94
[22] ,, ,,	S.S. Elbe	,,	1893–94
Field, Comr. A. M., R.N.	H.M.S. Egeria	China Sea	1893
,, ,,	,,	Penang and Suez	1894
,, ,,	,,	Perim, viâ Suez	1894
[29] Free Thomas, R.N.R.	S.S. Port Chalmers	Australia, viâ Cape, and home, viâ Suez.	1893–94
,, ,,	,, ,,	Melbourne, viâ Cape, and home, viâ Suez.	1894
Gibson, J. H.	S.S. Wydale	East Coast of North America	1894–95
Gracie, G. S.	Holyrood	Portland (Oregon)	1893–94
Gregory, S. M.	S.S. Menelaus	Java, viâ Suez	1891–92
Grier John	S.S. Antenor	Batavia, viâ Suez	1891–92
Guthrie, W. E.	S.S. Bellerophon	China, viâ Suez	1893
[24] Harvey, R.	S.S. Massilia	Sydney, viâ Suez	1894
[25] Henderson, J.	Prince Oscar	Valparaiso	1893
[23] Hepworth, M. W. C.	S.S. Port Albert	Adelaide, viâ Cape and Yokohama.	1894
[26] ,, ,,	S.S. Port Victor	Sydney, viâ Cape	1894
Horsfall, F. P., R.N.R.	Travancore	Cape Town, Newcastle (New South Wales), and San Francisco.	1893–94
Hutchinson, J. W. P.	S.S. Stentor	Java, viâ Suez	1893
Jackson, C.	S.S. Palamed	China, viâ Suez	1893
,, M. H. F.	S.S. Telamon	China, viâ Suez, and New York	1891–92
,, T. S.	S.S. Palinurus	China, viâ Suez	1891–92
[27] Jamieson, D. E.	S.S. Port Pirie	Australia, viâ Cape, and home, viâ Suez.	1894
Jones, Henry	S.S. Telemachus	China, viâ Suez	1893
Kemp, A. H.	Barque Hudson	New Zealand	1893–94
[28] Kraemar, Soren	Yacht Siggen	Spitzbergen	1894
[29] Lace, E.	S.S. Elvira	Wilmington, Savannah, and Monte Video.	1893–94
Leader, W. C.	S.S. Anglian	Cape Town	1894
Lee, W.	S.S. Polyphemus	China, viâ Suez	1891–92
McGregor, J.	S.S. Glenartney	,, ,,	1894
McKinnon, W. C.	Barque Port Glasgow	Sydney	1893
Martin, John B.	Opawa	New Zealand	1893–94
[7] Miller, A. T., R.N.	School Ship Conway	Off Rock Ferry, Cheshire	1894
[30] Millican, J. W.	S.S. Loughrigg Holme	Quebec and Alexandria	1893–94
[31] Milne, W. F.	S.S. Eclipse	Davis Straits	1894
Milner, W. H.	R.M.S. Pará	West Indies	1894
,, ,,	,, ,,	,, ,,	1894
Mitchell, George	S.S. California	New York and Mediterranean Ports.	1893–94
,, ,,	,, ,,	Mediterranean Ports, New Orleans and New York.	1894
[32] Moseley, F. J., R.N.R.	R.M.S. Anglian	Cape Town, &c.	1894
[33] ,, ,,	,, ,,	,, ,,	1894
Mullan, F. C.	S.S. Romney	Batavia, viâ Suez, Shanghæ	1893–94
Murdoch, Peter	Sierra Lucena	Bombay and Rangoon	1893–94
Nelson, Robert	S.S. Myrmidon	China, viâ Suez	1892
[22] Niles, W. H.	Ben Cruachan	Monte Video	1893–94
Nish, H.	S.S. Cyclops	China, viâ Suez	1891–92
Norman, Francis	Milton Stuart	Calcutta	1893–94

	Captain's Name.	Ship.	Voyage.	Year.
	Pattman, R.	Loch Torridon	Melbourne	1894–95
	Peebles, R.	Barque Carradale	„	1893–94
[34]	Penteu, Walter	S.S. Wilcannia	Australia, viâ Cape, and home, viâ Suez.	1893–94
	„ „	„ „	Adelaide, viâ Cape and home, viâ Suez.	1894
[35]	Philip, ——	Pericles	Sydney, viâ Cape	1893–94
	Price, J. H.	Othello	Melbourne	1893–94
	Pulford, J.	S.S. Patroclus	Batavia, viâ Suez	1891–92
	Purdy, Thomas	S.S. Dardanus	China, viâ Suez	1891–92
	Purey-Cust, Lieut. and Comr. H. E.	H.M.S. Dart	At New Hebrides	1893
	„ „	„ „	In Norfolk Bay, Tasmania	1894
	Randall, W.	Laomene	Calcutta	1893
[36]	„ „	„	Calcutta and San Francisco	1894–95
	Rawlings, E. S.	S.S. Ajax	China, viâ Suez	1891–92
[37]	Rigaud, H. C.	R.M.S. Magdalena	Monte Video, &c.	1893–94
[9]	„ „	„ „	East Coast of S. America	1894
	Riley, J.	S.S. Teucer	China, viâ Suez, and New York	1892
[38]	Robertson, Thomas	S.S. Active	Greenland	1894
	Rorison, J.	S.S. Anchises	China, viâ Suez	1892
	„ „	S.S. Bellerophon	„ „	1891–92
	Rosseter, W. L.	Sheila	Calcutta and Demerara	1894–95
	Russell, E.	Barque Routenbeck	Australia, Honolulu, Victoria, B.C.	1892–94
[22]	Sargent, A. H.	Pleione	New Zealand	1893–94
[22]	Scott, G. P.	Crompton	Cape Town, Newcastle (N.S.W.), and San Francisco.	1893–94
[22]	„ „	„	San Francisco	1894–95
	Scougall, H.	Barque Closeburn	Rio de Janeiro, Rangoon, and Talcahuano.	1892–94
[39]	Seaton, W. A., R.N.R.	S.S. Thames	China, viâ Suez	1893–94
	Simpson, Alexander	Barquentine Traveller	Ivigtut	1894
	Simpson, Alexander	S.S. Thermopylæ	Australia, viâ Cape	1894
	„ „	„	Melbourne, viâ Cape Town	1894
[40]	Simpson, Lieut. and Comr. C. H., R.N.	H.M.S. Stork	At Malta	1894
[40]	„ „	„	„	1894
[41]	Smith, James	S.S. Dunera	Calcutta and Madras, viâ Suez	1894
[41]	„ „	„	India, viâ Suez	1894
	Smyth, W. H.	SS. Pretoria	Cape Town, &c.	1894
[42]	„ „	„	Cape Town and Zanzibar	1894–95
[43]	Spalding, T. F.	S.S. Australasian	Australia, viâ Cape Town	1893–94
[43]	„ „	„	„ „	1894
[43]	„ „	„	„ „	1894–95
	Stenhouse, James	Anaurus	Cape Town, Newcastle, N.S.W., and San Francisco.	1894–95
	Streater, R.	Euterpe	New Zealand.	1893–95
	Thomas, H. G.	S.S. Yarrawonga	Australia, viâ Cape, and home, viâ Suez.	1894
	„ „	„ „	„ „ „	1894–95
	Towell, William	S.S. Jason	China, viâ Suez, and Java, viâ Suez.	1891–92
[44]	Trench, F. P., R.N.	H.M.S. Royal Arthur	Off W. Coast of South America	1894
[45]	Trott, Samuel	S.S. Minia	At Halifax	1893–94
	„ „	„	Halifax and in North Atlantic	1894
	„ „	„	On east coast of North America	1894
[46]	Tyson, John	S.S. Arab	Cape Town	1894
[46]	„ „	„	Zanzibar, viâ Cape Town	1894
[47]	„ „	„	Cape Town, &c.	1894

Voyage.	Year.
- - - -	1894
Suez - - -	1894
Suez, and New York -	1891-92
Suez - - -	1894
Suez - - -	1891-92
o, and Australia - -	1893-94
co - - -	1893-94
Suez - - -	1891-92
an, via Suez, and New	1895-94
- - -	1894
- - - - -	1894
a Suez - -	1894
,, - - -	1895

isters were kept chiefly by Officers, as

y R. Walton, Chief Officer, G. Pattrick, Officer, F. E. Cope, 2nd Officer, and J. son, 3rd Officer.
Herbert S. Brading.
A. Pike.
Alan B. Harper.
by Messrs. Hohn, Martin, Dawson, and
Ellis Nilson.
William H. Marklew, 4th Officer.
J. Vessey Lawther, 4th Officer.
Coulton Elliott.
F. F. Henderson, R.N.
by G. W. Smith.
R. A. Ellis, 5th Officer.
Alex. M. Rodgers, Surgeon.
Sidney G. D. Andrews, Chief Officer.
Lieut. Lewis D. Penfold, R.N.
by E. H. Garland, H. M. Sperling, and
ken.
A. Hamilton Thacker, 2nd Officer.
Charles E. Pyke.
Lieut. A. G. Moggridge, R.N.
Wm. Geo. Squares.
Bernard Burt, 4th Officer.
Messrs. G. R. Picton and Thwaites.
G. Pattrick, Chief Officer, F. E. Cope, 2nd
r, and J. Sandison, 3rd Officer.
C. Pickering, 4th Officer, A. A. Mellin, 5th
r, and P. G. Cadiz, 6th Officer.
John M. Arnaud.

APPENDIX III.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Barometers.	Aneroids.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1894, afloat	242	573	1,443	344	354	197	90
Issued since	88	132	384	89	69	31	4
	330	705	1,827	433	423	228	94
Returned since	87	116	402	79	68	25	26
April 1st, 1895, afloat	243	589	1,425	354	355	203	68

INSTRUMENTS supplied, &c. for use at Naval Stations.

April 1st, 1894, in use	77	65	236	32	39	9	11
Issued since	3	7	32	3	4	1	1
	80	72	268	35	43	10	12
Returned since	3	1	31	2	2	—	1
April 1st, 1895, in use	77	71	237	33	41	10	11

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1895.

Afloat in Royal Navy	243	589	1,425	354	355	203	68
In use at stations	77	71	237	33	41	10	11
In store at M.O.	22	128	185	118	120	35	40
" Chatham	18	52	106	27	32	24	15
" Sheerness	6	20	39	15	16	10	6
" Portsmouth	19	55	133	49	52	27	9
" Devonport	21	47	125	38	40	19	16
" Queenstown	2	1	15	3	3	—	4
" Gibraltar	2	3	9	3	3	—	4
" Malta	7	16	43	3	8	1	6
" Bombay	4	2	2	2	3	1	4
" Halifax	3	4	22	5	4	2	7
" Bermuda	4	2	5	4	9	2	4
" Jamaica	2	3	27	2	2	1	3
" Cape of Good Hope*	4	7	19	4	4	3	4
" Trincomalee	3	7	20	4	4	1	4
" Hong Kong	21	13	27	9	12	2	20
" Coquimbo	3	6	16	4	3	1	19
" Sydney	7	9	23	9	6	1	11
" Esquimalt	4	7	19	3	6	—	—
Total, April 1st, 1895	472	1,042	2,497	690	723	343	255
Lost, &c. since April 1st, 1894	—	11	252	25	16	17	7
Under repair April 1st, 1895	30	4	12	—	—	—	—

* To January 1st, 1895.

APPENDIX IV.

Instruments supplied, &c. to Mercantile Marine.

Per Account.	Barometers.	Compasses.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1894, afloat	106	—	627	—	1	106	340
Issued since	50	—	304	—	—	37	157
	156	—	931	—	1	143	497
Returned since	51	—	313	—	—	47	171
April 1st, 1895, afloat	105	—	618	—	1	96	326

Instruments at Stations, viz., Telegraph Offices, Observatories, Fishing Villages, &c.

April 1st, 1894, in use	285	2	267	59	69	56	10
Issued since	17	1	30	3	9	3	4
	302	3	297	62	78	59	14
Returned since	12	1	25	4	4	1	1
April 1st, 1895, in use	290*	2	272	58	74	58	13

Disposition of Board of Trade Instruments on April 1st, 1895.

In merchant ships	105	—	618	—	1	96	326
In use at stations	290	2	272	58	74	58	13
In store at M.O.	39	3	257	19	24	29	100
At Liverpool Agency	7	—	33	—	—	12	35
„ Aberdeen „	4	—	27	—	3	4	23
„ Glasgow „	2	—	9	—	—	3	10
„ Dundee „	18	—	45	—	—	15	41
„ Hull „	2	—	9	—	—	1	4
„ Cardiff „	2	—	18	—	—	2	10
„ Southampton „	5	—	29	—	—	5	28
Total, April 1st, 1895	474	5	1,317	77	102	225	585
Lost, &c. since April 1st, 1894	3	—	102	—	1	22	41
Under repair April 1st, 1895	7	—	—	1	1	—	—

* Of these barometers 202 are lent for use of seafaring communities at fishing villages and ports.

APPENDIX V.

Report of Inspections in Ireland and Wales, 1894.

I have to report that I have completed my inspections, with the exception of the following places which were left unvisited:—

Telegraphic stations.—Donaghadee and Roche's Point.
Weekly Weather Report stations.—Foynes, Kilkenny, and Llandovery.
Station of the Second Order.—St. David's.

The following is the report of my visits:—

Holyhead, visited September 19th.—The new observer, Mr. Chope, had his station in very good order. He seems attentive and careful, and promises to be a good reporter.

Dublin, Phœnix Park, visited September 20th.—The observer was on leave, but the substitute, Corporal Blight, seemed competent and intelligent. The station was, as usual, in good order.

Dublin, Fitzwilliam Square, visited September 21st.—This station was, as usual, in perfect order.

Dublin, Glasnevin Gardens, visited September 21st.—The station is in good order, but I have had to request the Superintendent to inclose with railings a space larger than the present area, cases having occurred of instruments being lifted from outside and therefore of probable disturbance of thermometer indices.

Lissan, visited September 22nd.—The station was in good order. Sir N. Staples takes the barometer readings himself.

Armagh, visited September 22nd.—This station calls for no remark; it was in the usual good order.

Colebrooke, visited September 24th.—This station is in good order, but there is no substitute in case of illness of the observer.

Londonderry, visited September 25th.—The station was in good order, but I fear the observer will shortly leave the locality, as he is resigning his appointment.

Malin Head, visited September 26th.—The observer is fairly good, but has not, as yet, made proper use of the self-recording aneroid I left there in 1893. I fear he may, probably, leave the station on the ground of health and exposure in winter.

Edenfel, visited September 27th.—This weekly weather report station was in good order.

Markree, visited September 28th.—This station was in good order. I tested the assistant and found her able to read the instruments quite correctly.

Belmullet, visited October 1st.—The station was in good order. Difficulty has been found in obtaining correct telegrams when the observer is on leave, but there is a prospect of an improvement in this, as one of the younger sisters shows considerable aptitude in the work.

Currygrane, visited October 3rd.—The former observer, S. Lecky, had left in August without sufficiently instructing his brother, W. Lecky, who succeeded him. I had, therefore, to instruct him carefully, and I hope he may turn out satisfactory.

Arley Cottage, visited October 4th.—The instruments are in good order, and the observations carefully kept.

Valencia, visited October 10th.—I have found this station, as regards the telegraphic reports, in good order. I am glad to say that the telegraphic service from Cahirciveen is more prompt and regular than it was from the Island.

Parsonstown, visited October 12th.—I am sorry to say that the reports from this station during the past year have been very unsatisfactory, the observer having been very careless. I have, with Lord Rosse's approval, dismissed him, and appointed another youth in his place for the telegraphic work, and yet another for the climatological observations. These two boys appear intelligent and willing, and Dr. Bœddicker, the astronomical assistant, has kindly promised to see to their further instruction. The instruments were clean and in good order.

St. Anne's Head, visited October 15th.—The observer here is a new man, but had been well instructed by his predecessor. There is a difficulty about finding a substitute in case of illness. There are two lighthouses and four keepers, but most of these men are anxious to leave the station owing to its loneliness, and are not willing to undertake the work. The instruments are all in very good order.

TELEGRAPHIC, WEEKLY WEATHER REPORT, and SECOND ORDER STATIONS, 1894.

Corrections to be applied to the readings of :—

STATIONS.	Dry Bulb.	Wet Bulb.	Spare Therm.	Max. Therm.	Min. Therm.	Grass Min.
Armagh	−0°3	−0°2	—	−1°1	—	+0°1
Belmullet	−0·2	−0·1	—	−0·1	−0·1	—
Brookeborough	−0·5	−0·6	—	+0·1	−0·3	—
Dublin (City)	−0·3	−0·3	—	−1·0	+0·2	—
Dublin (Glasnevin)	−0·2	−0·1	—	−0·3	+0·5	+0·9
Dublin (Phœnix Park)	−0·4	−0·2	−0·7	−0·1	−0·1	+0·3
Edenfel (Omagh)	—	—	—	+0·4	+0·2	—
Edgeworthstown	−0·3	−0·3	—	+0·7	+0·7	+0·7
Holyhead	−0·5	−0·2	—	−0·5	+0·3	−0·3
Lissan	−0·1	−0·1	—	+0·1	+0·1	—
Londonderry	−0·1	−0·1	—	+0·3	+0·3	—
Malin Head	−0·2	−0·1	−0·3	+0·1	−0·5	—
Markree Castle	−0·1	−0·1	—	−0·5	+0·5	—
Mount Nugent	−0·1	−0·1	—	+0·4	+0·4	+0·3
Parsonstown	−0·3	+0·2	—	+0·1	+0·1	—
Valencia Tel. Report	−0·6	−0·5	—	−0·4	+0·4	—

(Signed) ROBERT H. SCOTT.

Report of Inspection of Scottish Stations for Year 1894.

Barometers.

The barometers at the stations were compared with inspector's standard No. 690, which was in good order throughout the inspection as shown by comparisons with the standard in Edinburgh at the beginning and again at the end of the inspection. I have to report that the barometers continue to be correct, and are kept in the same good order as stated in last year's report. Table I. gives the comparisons, with corrected readings, of No. 690, the readings of the station barometer not being corrected.

Table I.

Stations.	Inspector's Standard No. 690 corrected.	Reporting Barometer uncorrected.	Check Barometer uncorrected.	Remarks.
	Inches.	Inches.	Inches.	
Fort William	29·515	29·520	—	
Deerness	29·740	29·762	—	
Dunrossness	29·407	29·396	29·402	
Wick	29·984	29·980	29·920	Check barometer at higher level.
Dunrobin	30·048	30·048	—	
Lairg	29·512	29·490	—	
Stornoway	29·855	29·850	29·850	
Glencarron	29·572	29·576	—	
Nairn	30·192	30·182	30·190	
Gordon Castle	30·207	30·208	—	
Aberdeen	30·260	30·264	30·264	
Lednathy	29·406	29·408	—	
Dundee	30·030	30·030	—	
Marchmont	29·156	29·160	—	
Ladylaw	29·930	29·930	—	
Wolfelee	29·763	29·760	—	
Glenlee	30·276	30·280	—	
Ardrossan	30·504	30·505	—	
Rothesay	30·260	30·260	—	
Poltalloch	30·318	30·290	—	
Leith	30·097	30·098	30·100	
Ochtertyre	29·932	29·950	—	

Thermometers.

The minimum thermometers were carefully examined with the result that all were found in good order with the exception of the Stornoway minimum, which was badly out of order, as explained in special report of this station. It reflects much credit on the observers that this important thermometer, so liable to go wrong, is so constantly watched and kept in order.

TABLE II.

STATIONS.	Standard Thermometer. No. 4853.	Dry Bulb.	Wet Bulb.	Spare Thermometer.	Max. Thermometer.	Min. Thermometer.	Time in Water in Minutes.	Change of Temperature.
Fort William - - -	60°·4	+0°·2	+0°·2	° —	+0°·1	0°·0	180	+0°·2
Do. Observatory - -	60·4	—	—	—	0·0	−0·6	180	+0·2
Deerness - - - -	58·6	+0·1	+0·1	—	−0·9	−0·3	85	Uniform
Dunrossness - - -	57·0	+0·6	+0·3	+0·6	0·0	−0·2	150	Do.
Wick - - - -	56·0	−0·4	−0·5	—	0·0	0·0	80	Do.
Dunrobin - - -	59·4	0·0	+0·1	—	+0·1	−0·3	120	−0·2
Lairg - - - -	58·0	+0·3	+0·3	—	−0·1	+0·1	75	+0·3
Stornoway - - -	56·2	+0·6	+0·6	—	−0·4	−0·6	165	+0·3
Glencarron - - -	53·9	+0·1	+0·1	—	0·0	0·0	90	+0·3
Nairn - - - -	55·6	+0·7	+0·8	+0·2	+0·1	−0·1	90	+0·4
Gordon Castle - - -	55·2	+0·1	−0·1	—	+0·1	−0·2	105	Uniform
Aberdeen - - -	57·0	+0·3	+0·3	—	+0·2	+0·3	105	Do.
Lednathy - - - -	53·4	+0·2	+0·2	—	+0·2	−0·4	100	Do.
Dundee - - -	57·0	−0·5	−0·3	—	+1·4	−0·4	80	+0·2
Marchmont - - -	52·0	0·0	−0·1	—	0·0	0·0	240	+0·5
Ladylaw - - -	60·4	0·0	0·0	—	0·0	+0·1	165	+0·3
Wolfelee - - - -	51·0	−0·2	−0·2	—	+0·2	−1·0	100	+0·4
Glenlee - - -	52·8	+0·2	+0·2	—	−0·1	0·0	120	+0·2
Ardrossan - -	60·1	+0·2	+0·2	—	−0·2	−0·2	80	Uniform
Poltalloch - - -	57·5	+0·3	+0·3	—	+1·0	0·0	90	Do.
Rothesay - - -	52·9	0·0	−0·1	—	−0·1	−0·1	110	Do.
Leith - - - -	54·7	+0·1	+0·1	—	−0·1	−0·2	75	Do.
Ochtertyre - - -	57·6	0·0	−0·1	—	0·0	0·0	160	Do.

HYGROMETERS.

The dry and wet bulbs were in very good order at all the stations, as shown by the readings made immediately on opening the screens at the time of inspection, and compared with the hygrometric conditions of the atmosphere at the time of inspection.

NOTES of INSPECTION of the STATIONS.

Fort William, August 8th, 1894.—The instruments are in excellent order, and the observations are made with strict punctuality and correctness.

A new Stevenson's screen was got to replace the old one, to which the thermometers were shifted on July 19th. The seismometers were set up in the autumn of last year. Several changes have been made with regard to Beckley's gauge, with the result that more satisfactory readings are now obtained. The standard barometer was sent to Kew in March to be overhauled, and was returned to Fort William on July 19th. While at Kew, inspector's standard, No. 690, was used instead.

Deerness, August 11th.—The instruments are in excellent order, and the observations are made with great care and intelligence.

Dunrossness, August 16th.—The instruments are in very good order, and much care is given by the observers to secure punctuality and correctness. The small barograph is in good order, and the readings required by the office will be forwarded in a fuller manner than heretofore.

Wick, August 17th.—The instruments are in remarkably good order, and much intelligence and care is manifested by the observer. Improvement as regards an earlier despatch of the daily telegram is promised.

Dunrobin, August 18th.—A new hygrometer with opal scales was added in June, this, owing to close proximity to the sea, being very desirable. The instruments are all in good order, and the observations are made with care and intelligence.

Lairg, August 20th.—The instruments are well attended to, and the new observer understands the work of observing well.

Stornoway, August 22nd.—The minimum thermometer was found with about 10°·0 of the spirit lodged near the top of the column, which was stated to have been seen two days previously, but the observer delayed putting it right till the time of the inspection, otherwise the instruments were in good order, and the observations appear to have been made with care. As Mr. Forbes, the observer, is leaving Stornoway some time was spent in making inquiries and personally seeing the different applicants for the post.

Glencarron, August 23rd.—The instruments continue to be kept in excellent order, and the observations made with much intelligence and with scrupulous care.

Nairn, August 24th.—The instruments are in good order, and the observers make all endeavours to secure correctness and uniformity in the readings.

Gordon Castle, August 24th.—The instruments are all in good order, and the observations made with much care and intelligence.

Aberdeen, August 25th.—The Stevenson's screen has been painted. The instruments at this station and observatory are in excellent order, and the observations are made with exemplary care and exactness.

Lednathy, August 27th.—The instruments are in very good order, and the observer is remarkably shrewd, accurate, and intelligent.

Dundee, August 28th.—The instruments continue to be kept in very good order, and much intelligence and care is shown in the observations.

Marchmont, September 27.—The instruments are in remarkably good order and correctly read by the new observer, except the barometer, which, however, was read in a way by which the correct reading is easily ascertained.

Ladylaw, September 27th and 28th.—The instruments are in excellent order, and much enthusiasm, care, and intelligence is manifested in carrying on the work of observing.

Wolfelee, September 28th.—The instruments continue to be well kept and carefully and correctly observed. At this station the observations were interrupted for two or three months in 1893, but were resumed under the same observer, and with the same instruments, in the autumn of that year.

Glenlee, September 29th.—The instruments are in excellent order, and the work of observing is well carried out.

Ardrossan, October 1st.—The instruments are in good order, and the observations are carefully made. The heights of two bench marks, between which Mayes' house is situated, have been sent, with an instruction to have the height of the barometer measured from one or other of them.

Poltalloch, October 2nd.—The instruments are in very good order, and the observations are carefully and intelligently made by the new observers.

Rothesay, October 3rd.—The instruments are all in very good order, and much care is given to secure accuracy and punctuality in making the observations.

Leith.—The instruments are all in very good order, and much care is given by the observers to give satisfaction with the observations. The additional notes asked for will in future be added to the daily telegram.

Ochtertyre, October 11th.—The instruments are all in excellent order, mostly in duplicate, and much enthusiasm is displayed in the whole work, which is well done. A new set of underground thermometers at depths of from 3 to 48 inches has recently been added.

(Signed) A. BUCHAN.

REPORTS of INSPECTION of the STATIONS in ENGLAND.

1. TELEGRAPHIC REPORTING STATIONS.

Hurst Castle.—The present observer has been in charge for only a few months, the former observer having been pensioned off by the Trinity House. The thermometers and rain gauge are in the garden, and are attended to by the chief lightkeeper and his wife. Barometers were in good order, but in a bad light, and I saw no probability of any improvement. The thermometers were well exposed, but the screen needed repairs, and the wet-bulb was very badly mounted. Wind direction was magnetic, not true, and rain-gauge was much too near a hedge. The station is a very open one. I re-mounted the wet-bulb, and gave minute instructions as to its management, and spent four hours in explaining the action of the various instruments to the observer, who, while affecting to understand what was said, was nevertheless, in my opinion, by no means quick at comprehending. Errors in reducing his barometer readings were numerous, and I am sorry to say, that since the inspection the said errors have been frequently repeated.

Jersey.—Visited during *heavy* rain and strong winds. Barometers in observer's house at St. Aubin's, clean, and apparently well managed. Thermometer screen and rain-gauge on an unused platform of the railway station, well exposed as a whole, but the gauge was partially affected by a flag-staff, which was much too near to it, and the thermometer screen needed considerable repairs. Wet-bulb badly mounted, but clean. Remounted it and gave necessary instructions. Position is bad for observations of wind (when northerly) and of sea disturbance. Sunshine recorder is at Fort Regent, near St. Helier's; it is firmly fixed and exposure is perfect.

With regard to the proposal to shift the instruments to the Jesuit College at Maison St. Louis, and to supply the Rev. M. Dechevrens with other instruments, I beg to report that I visited the College and saw M. Dechevrens, and spent about three hours with him inspecting his grounds (in heavy rain) and discussing the question generally. First of all, M. Dechevrens was prepared, and anxious, to take over the telegraphic

reporting instruments and to send telegrams at once; but as part of a more general arrangement, which was to include the grant to the College of a self-registering anemometer, rain-gauge, and sunshine recorder. The grounds of the College are extensive, and there is abundant room for such instruments. Fresh buildings of considerable size are being constructed for astronomical work, and on one of these it was proposed to place the anemometer. I very much doubt, however, whether the position is at all likely to prove a good one for anemometry, as it is on the side of a steep hill, which could not fail to affect the wind's record. M. Dechevrens would prefer anemometer, rain-gauge, &c. of some generally approved type to any novel invention, but would be willing to conduct experiments with any new form, if wished. He, however, made one condition, viz., that the instruments must be presented to the College without any reserve—he would not undertake to receive them at all if required to send the original traces, or, indeed, anything more than an occasional (weekly or monthly) summary to the Meteorological Office. The instruments and all their records must be the property of the College, and completely within the control of himself or his successors. I do not think, however, that the telegraphic reporting instruments should be transferred to this new position at present, although I think a better position for them should be found before long, as we get really no correct idea of sea disturbance and a very poor one of wind in the present position of the observer.

Dungeness.—Instruments at this station were in good order, excepting the wet bulb, which had two thicknesses of coarse calico on it, and was consequently of little good. Re-mounted it and gave instructions. Wind direction had hitherto been magnetic, and height of barometer above sea is certainly 7 feet greater than has hitherto been accepted. Observer is anxious to report well, and took readily all the suggestions made to him. Thermometer screen needs repairs generally, and re-painting inside. I gave careful attention to the question of the barometric readings, and hope some improvement in them may be found in future.

North Foreland.—At this station the reporting barometer was in good order and well read. Wet-bulb mounting defective (two thicknesses of muslin, and dirty), and wind direction was magnetic. The new minimum thermometer supplied in the spring had not been taken into use, and the old one was defective. I spoke very strongly about the neglect thus shown. Observer seemed to me to have exaggerated the force of Northerly winds when at all strong. I therefore drew his attention to the matter. As a whole, however, he is a competent man, and takes considerable interest in his work.

Cambridge.—The new observer at this station is Miss Walker, one of the assistants in the Astronomical Observatory. She appears to me to be very competent, and earnest in trying to do the work well. The wet-bulb thermometer was too thickly covered with calico, but was clean; though I fear it had been neglected by previous observer, as the bulb had a very thick covering of lime, &c. on it. Re-mounted the instrument gave all necessary instructions, and left a supply of proper muslin and wick for future use. The bushes, &c. surrounding the inclosure in which the thermometers and rain-gauge are placed have grown very much, and need to be well cut back and lowered, or they may vitiate the readings of the rain-gauge seriously. The position, even then, will not be thoroughly good, as tall trees abound in that region; but no better site can at present be found.

Sunshine recorder was on a stand on the roof of the observatory, excellently placed, with perfect exposure.

Yarmouth.—Instruments in same position as for many years past, and carefully managed. Wet-bulb thermometer wrongly mounted, but in all other respects instruments were in good order. Re-mounted wet-bulb, and left proper muslin, &c. with observer. Corrections to wet bulb and maximum are high.

The yard in which the instruments are placed is smaller than could be wished, but I know of no better site, and certainly of no better observer.

2. Second Order Stations.

Southampton.—The instruments at this station are at the Ordnance Survey Office, and are in charge of the librarian. They are all in excellent order, and are most carefully attended to. Barometer in good light; thermometers in an enlarged "Stevenson" screen, but the inclosure in which they were placed is certainly rather small. It is, however, adjacent to a wide road and large open spaces, so that the indications probably represent the temperature of the locality fairly well. I fear, however, that, in the case of rain with high winds, the rain-gauge may get some drops of water from the shrubs which are in different parts of the inclosure. Wet-bulb thermometer was very clean and properly moistened. Sunshine recorder is on top of one of the gables of the buildings; the exposure is perfect, but instrument was slightly out of the level in an E. to W. direction. This was rectified, and I recommended that it should be cemented into its improved position.

Eastbourne.—Instruments at this station are in various parts of the town; barometer (out of order) is in one of the shelters under a terrace facing the sea; thermometers are in a Stevenson screen in a large open space near the sea; rain-gauge is in a triangular space in a more central part of the town, while the sunshine recorder is on top of the Grand Hotel. Observer's method of setting the barometer is not at all satisfactory, but improvement was promised. Wet-bulb was most unsatisfactory, the bulb being simply smothered with cotton wick. The other instruments were well managed, but the position of the sunshine recorder I consider to be one of extreme danger to the observer when changing the card on dark stormy evenings. The observations are taken with great regularity. I re-mounted the wet-bulb, and gave observer careful instructions as to the proper method of managing all of the instruments.

St. Leonards.—Excellent instruments, and, as a whole, well exposed. Mounting of wet-bulb thermometer, however, very defective; muslin bad, and too much both of it and of the wick (or, rather, the brown worsted) with which it was mounted. Re-mounted it in proper manner, gave instructions for future, and left supply of proper muslin, &c. Sunshine recorder was slightly out of level in N. to S. direction, and a building recently erected, was likely to vitiate the indications for about an hour in the early mornings in autumn and spring. Found new position for the instrument, which observer promised to have removed at once. The building referred to was erected so recently that no harm had resulted at time of inspection.

Uppingham.—An excellent station, and observations taken with scrupulous care and promptitude. The thermometer screen (a modified "Glaisher") having become too much sheltered by some trees, the observer proposes to remove it on the 1st January next to a more open space. Instruments are good.

Belvoir Castle.—This station has not yet been fully installed, but observer (Mr. Divers, head gardener) hopes to begin reporting on 1st January 1895. At present he needs further instruction with regard to wind

and cloud observations. Instruments are very accurate. Thermometers are on a very large "Glaisher's" stand. Rain-gauge, a new eight-inch of "Glaisher" pattern, but with a long tube extending to nearly bottom of collecting can, is very well exposed. Sunshine recorder is slightly sheltered to westward and west-north-westward, perfectly open elsewhere. It is a "twin" photographic recorder by Jordan. Bearings are true. Barometer, a Fortin's standard, has been recently repaired, but verified only by maker (Negretti and Zambra). Observer is ready to make every arrangement for having a good and continuous "Second Order" Station.

3. Third Order Stations.

Sandgate.—This is a rainfall station only, and the observer does not at present see his way to increasing the work of observing. Gauge is an ordinary 5-in. metal gauge in good order, and situated near the edge of a kind of terrace (undercliff) overlooking the main street of the town and facing the sea. It is about on a level with the tops of the houses in the lower street, and the effect of currents of wind blowing up the side of the cliff is thus cancelled. Rim was 1 ft. above the ground and about 47 ft. above sea, but Mr. Stilgoe (the observer and town surveyor) promised to level it accurately and send the results to the Meteorological Office.

Kearsney Abbey (near Dover).—Rainfall station only, and observer does not propose to make any increase in meteorological work. Gauge, a 5-in. ordinary metal gauge, was very badly placed, catching the droppings from several bushes, &c., with the branches of which it was largely covered. Found a better (but not excellent) position for the instrument, and Mr. Curtis (the owner of the estate), whose gardener takes the observations, promised that it should be at once shifted. I do not think the records hitherto recorded are fit to be published, owing to the very bad position of the gauge.

* *Ketton Hall.*—Full set of instruments, but observations made only once daily. Mr. Divers (late head gardener) has now gone to Belvoir Castle, but the new one (Mr. Drabble) appears to read the instruments correctly, and Mr. Coventry, the owner of the instruments, applies all the corrections accurately. The instruments are in a hollow. Dry, wet, maximum, and minimum thermometers are in a Stevenson's screen fairly well exposed, but grass thermometer not at all well exposed, and reading about 1·5 too low. Gave instructions to cut the grass, &c. as necessary. Rain-gauge badly placed, being dominated by an apple tree to south-westward of it, the tree having grown gradually during several past years. Mr. Coventry has agreed to shift the instrument to a better position on January 1st, 1895. Mr. Coventry is not inclined to take evening observations.

* *The Holmes, Ketton.* (Mr. Coventry's private house.)—Rainfall stations only. Gauge, a 5-in. Snowdon pattern, not very well exposed, in a kitchen garden on east side of house. Exposure would be good but for some trees to the northward of gauge which dominate it too much. Observations are very regularly made, but observer will not do more than at present.

* *Colley Weston.*—Rainfall station only. Observations taken by Miss Amy Tasker. Gauge belonging to Mr. Coventry, of the Holmes, Ketton. The instrument is a 5-in. Snowdon gauge, very well placed near the church, at an altitude of about 270 feet above mean sea level. Exposure could hardly be better, and readings are taken regularly.

* It is highly probable that Mr. Coventry will be removing in about 12 or 18 months' time, and he will take all his instruments with him.

Chatham.—Observer is the Instructor in Surveying. Barometer, a very good Fortin standard, not in a good light; recently cleaned and verified at Kew. Thermometers—dry, wet, maximum, and minimum, very good instruments, well exposed in a Stevenson's screen. Solar radiation read six degrees too low (new one at once put in its place). Rain-gauges, three in number, are in 8-in. "Glaisher's"; are too near the open fence of the inclosure, but, on application, the fence will be thrown back 5 ft., which will make the exposure very good. Observer cannot take more than one set of observations per day.

Rothamsted (Harpenden).—Barometer good; dry and wet maximum and minimum thermometers, in a Stow's screen, slightly sheltered by trees, but fairly well exposed for all that. Solar radiation in good position; terrestrial radiation utterly useless hitherto, being thoroughly screened by surrounding objects from radiation of any kind. Instrument to be moved at once. Sunshine recorder very well exposed, but slightly out in azimuth lately (to be rectified). Rain-gauge well exposed. Observations now intelligently made by man named Reed, one of the assistants. Cannot take more than one observation a day. Arrears of returns to be dealt with at once.

TABLE of CORRECTIONS necessary to bring the READINGS of the THERMOMETER into agreement with the INSPECTOR'S STANDARD.

Names of Stations.	Corrections.					Reading of Inspector's Standard (corrected).	Notes.
	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare.		
1. TELEGRAPHIC REPORTING STATIONS.							
Hurst Castle	−0°·7	+0°·1	−0°·7	−0°·4	—	62°·1	
Jersey	−0·1	−0·3	−0·1	−0·3	—	61·7	
Dungeness	−0·1	−0·1	0·0	−0·1	—	61 9	
North Foreland	−0·4	−0·1	+0·5	+0·6*	−0·4	59·6	* Out of order, new one substituted.
Cambridge	−0·3	−0·2	−0·5	+0·7	—	59·8	
Yarmouth	−0·5	−1·0	−1·0	0·0	—	60·0	Substituted dry for wet and *vice versa*.
2. SECOND ORDER STATIONS.							
Southampton	−0·1	−0·3	+0·1	+0·2	+0·2*	60·2	* Grass Min. Ther.
Eastbourne	−0·1	−0·1	0·0	+0·1	—	68·0	
St. Leonards	−0·4	−0·6	0·0	0·0	0·0*	65·0	* A Kew Standard.
Uppingham	−0·2	0·0	−0·4	−0·3	—	59·5	
Belvoir Castle	0·0	0·0	0·0	0·0	+0·6*	52·0	* Grass Min.
3. THIRD ORDER STATIONS.							
Ketton Hall	−0·2	−0·4	+0·1	−0·2	+0·3*	51·1	* Grass Min.
Chatham	−0·3	−0·2	+0·5	−0·1	+5·5*	53·8	* Solar Max. in Vac. (changed immediately) new one + 0·5.
Harpenden	+0·2	+0·1	−0·6	+0·1	+1·7*	52·0	* Spherical bulb grass min.

In each case the thermometers were in water for more than 60 minutes before being read.

(Signed) FREDC. GASTER.

SIR, October 16, 1894.

I HAVE the honour to submit herewith the following reports upon the inspection of the stations visited by me this year.

I am, &c.

R. H. Scott, Esq., F.R.S. (Signed) R. H. CURTIS.

Newquay, September 3rd.—The sunshine recorder here has not been attended to of late as carefully as could have been wished, and I pointed out to the observer the necessity for more punctual and careful attention to the changing of the cards. The wooden stand having become warped, I readjusted the recorder and secured it in its position.

Scilly, September 6th.—The instruments were in good order except that the wet-bulb had too thick a covering upon it. The observer read his instruments and reduced his barometer reading quickly and correctly. As requested, I directed his attention to the use of the self-registering aneroid, and I have reason to think a more intelligent use will be made of that instrument in the future. I also gave him some instruction on the subject of upper clouds, which I found he much needed. The sunshine recorder has a perfect exposure.

Plymouth, September 8th.—The minimum thermometer had half a degree of spirit at the top of the tube; but, with this exception, the instruments were all in good order, and they are carefully attended to. I dislodged the spirit before leaving. Since the last inspection the barometer had been removed to the observer's new residence; I found it hung in a bad light, and therefore arranged for its removal to a better light on the opposite side of the room. The observer expects the Corporation will shortly procure a self-recording anemometer, and, at his request, I visited two alternative sites proposed for its erection, either of which would be very good. The observer also hopes to shortly commence daily observations of sea temperature from a hospital hulk moored in the Sound.

Prawle, September 11th.—The observer here had been changed since the station was last inspected. The wet bulb was very badly mounted, and the bulb was immersed in a vessel containing fully half-a-pint of water; with this exception, the instruments were in good order. The observer read correctly, and reduced his barometer reading properly, although not very quickly; his deputy also did the work accurately, but was very slow. I found that hitherto the wind directions reported have been "magnetic" instead of "true," but this will in future be altered. I also gave the observer some instruction in the matter of upper clouds. The observer appeared to me to be anxious to understand his work, and to do it satisfactorily.

Arlington Court, September 12th.—The wet bulb at this station was badly mounted, and *twine* was in use instead of cotton wick, the result being that the bulb was not kept properly moistened. The maximum thermometer read half a degree too high, and the minimum as much too low, but in neither case could I detect any apparent cause for the large errors. The observer read correctly, and appears to do his work carefully and neatly.

Montpelier, Bristol, September 13th.—The instruments here were in excellent order, and Mr. Jones is a very good observer. As requested, I examined very carefully the maximum thermometer, which I found to

be a very good instrument. The site of the station is, however, not the best for temperature or rainfall observations.

Cirencester, September 14th.—Except that the thermometer stems were absolutely devoid of any black in the divisions, the instruments were all in good order. The sunshine recorder was in no way fastened to its stand, and was, therefore, always liable to be moved in changing the cards, or by wind; and the assistant observer, whom I saw (Prof. Ohm being absent on vacation), promised to have it at once secured by a couple of iron cramps.

Stokesay, September 15.—The instruments here were in fairly good order except the solar radiation thermometer, which had become useless. The barometer was tested by my standard, with which it very closely agreed. The thermometer screen is in a dilapidated state, and Mr. La Touche has promised to have another substituted for it. This station is very badly situated for wind observation.

Llandudno, September 17th.—A new position has recently been found for the sunshine recorder, which is now under the care of Mr. MacMaster, at West Bay. The situation is an excellent one, the instrument having a very good exposure at all seasons, and the observer is very punctual and careful in attending to the changing of the cards.

Stations.	Reading of Standard.	Corrections to be applied to the Readings of the						Remarks.
		Dry Bulb.	Wet Bulb.	Spare Therm.	Max. Therm.	Min. Therm.	Grass Min.	
	°	°	°	°	°	°	°	
Scilly - -	60·0	−0·7	−0·2	0·0	−0·7	0·0	—	
Prawle Point -	59·6	−0·5	0·0	*	+0·2	0·0	—	* No spare Thermometer.
Stokesay - -	58·7	−0·2	−0·3	—	−0·7	+0·3	+1·1	
Plymouth - -	57·8	0·0	−0·1	—	0·0	+0·5	+0·5	
Arlington Court	60·3	0·0	−0·1	—	−0·5	+0·5	—	
Bristol - -	58·0	0·0	0·0	—	+0·2	0·0	—	
Cirencester - -	55·0	0·0	0·0	—	+0·1	+0·1	—	

(Signed) R. H. Curtis.

Meteorological Office,
October 16, 1894.

Sir,

I beg to submit herewith the report of my inspection of various English stations.

I am, &c.
(Signed) John A. Curtis.

To
R. H. Scott, Esq., M.A., F.R.S.

Telegraphic Reporting Stations.

North Shields, September 4th.—The outdoor instruments have been removed to the opposite side of the Dockwray Square inclosure, in order to lessen the risk of accidental damage by children at play. There is,

however, still some liability in this direction, and I suggest that a letter be written to the Secretary of the committee having control of the square asking him to use his influence to prevent such damage as far as possible. The instruments were all in good order, except the rain-gauge, which needed repair.

York, September 7th.—I formed a favourable impression of Mr. Wright, the observer, who read the instruments accurately and quickly, and who appeared to me to be anxious to do well. The wet-bulb, though properly mounted, was coated with deposit. The most serious defect at this station is the position of the thermometer screen, which ought, in my opinion, to be removed about 20 yards to the south-east where it will have a much freer exposure.

Stations of the Second Order.

Aysgarth, September 6th.—The thermometer screen is now much sheltered by a shrubbery to the west, but I did not think it advisable to recommend any change. The outfit of this station is admirable, and the observations are carefully taken.

Bramley, August 22nd.—This is a new station, the instruments at which are the property of Mr. C. Bell, of Lockner Holt, Chilworth, who is obliged to discontinue observing for the present. The observer at Bramley is Mr. J. Bartlett, M.A. He is most enthusiastic in the work, and the station promises very well indeed. I found the wet-bulb thickly coated, and requested that rain water only be used in future to moisten it. A hill rises immediately behind the stations which must affect the direction of the surface wind when from any point between South and West. The thermometer screen is on the Stevenson principle, but not of the standard pattern. The rain gauge is not quite satisfactory.

Cronkbourne, Isle of Man, August 29th.—This is an excellent station alike for position, outfit, and management. The only faults I noticed were that the wet-bulb had too much muslin upon it, and that on the day of my visit the sunshine card was not quite accurately set in the groove.

Durham, September 5th.—Mr. Carpenter is a very competent and careful observer. Everything was in good order except that the rain-gauge was rather loose, and that the grass minimum thermometer had about 1° of separated spirit. This last defect I rectified and Mr. Carpenter promised to fix the rain-gauge firmly. There is a large shrub on the south of the thermometer stand (which is one of the "Glaisher" pattern) and close to it, but I do not think the readings are much affected by it, if at all.

Epsom, July 27th.—The observers at this station have recently been changed. Those now appointed, who are students at the college, are intelligent lads, with, however, no knowledge of meteorology. I spent a considerable time with them, and went as fully as possible into the details of the work. The wet-bulb was very improperly mounted and the grass minimum had spirit separated, which, with some difficulty, I corrected. The other instruments were in good order. Both the observers set and read the instruments accurately and quickly.

Gilcrux, near Maryport, September 1st.—This is a new station. The barometer has a large error, but a new one has since been purchased

from the Office, and is now in use. The outdoor instruments are good, and are well exposed in a garden at the back of the house. There is a difficulty about the 9 p.m. readings, but I hope this may be overcome. Mr. Monkhouse is not, at present, sure of being able to observe later than 8 p.m. The observer is most enthusiastic in the work. He reads the instruments accurately and quickly, and I think useful observations may be expected from this station. The rain-gauge was not quite firmly fixed.

Heysham Hall, August 31st.—The exposure of the outdoor instruments at this station is not quite satisfactory. The thermometer screen is in a kitchen garden, rather too near a greenhouse, and on the day of my visit was sheltered by some tall chrysanthemums, in pots, which it was promised should be removed. The screen is too small, and I gave instructions that the dry-bulb and wet-bulb thermometers should be brought away from the back louvres, against which they at present rest. The screen was placed over fine cinders, but Mr. Lomas promised to replace these with grass. The observer has been in the habit of setting the barometer from ·02 to ·03 in. too low, but this error will not, I think, be repeated.

Manchester, August 28th.—This station was in excellent order. Mr. Hazzlewood, the manager of the Corporation Depôt, in the Oldham Road, where the observations are taken, was absent from Manchester, but I saw the deputy observer, and went over the details of the work carefully with him, giving such instructions as were necessary.

It is a misfortune that arrangements cannot be made for evening readings at this very well managed station.

Prestwich, August 27th.—At this station the position of the out door instruments has been entirely changed. They now stand in the front of the asylum, perhaps a quarter of a mile away from the old site, and on the ground about 15 feet higher. The present position is exceedingly good, the instruments were in excellent order, and the observations appear to be very carefully attended to. A new thermometer screen is now in use. The sky was quite overcast at the time of my visit, and I was unable, therefore, to test the adjustment of the sunshine recorder. There are some newly-planted shrubs near the instruments, but these Dr. Clunn promised should be kept low.

St. Helens, August 28th.—All the instruments were in good order and the observations are taken with care. The thermometer screen, however, stands over limestone chippings, and I requested that these might be replaced by turf. This Dr. Robertson (who personally takes the observations) promised to try and get done. The observer hopes soon to obtain a sunshine recorder.

Seaham, September 5th.—All the instruments, including the barometer, are at the cemetery, and Mr. Leith, the superintendent of the cemetery, takes the observations, while Mr. Aird fills up the sheets. I met both gentlemen and carefully tested Mr. Leith's readings. He read the barometer a little in error at first, but this, I think, will not be repeated. The thermometer screen was so much sheltered by a young tree to the south of it (and right over it) that I advised its removal to a better site which I pointed out. Mr. Aird promised to have the change made at once. The grass under the thermometer screen was quite long, and the wet-bulb was coated with deposit.

Sheffield, September 8th.—Everything was in excellent order at this station, and the observations are made with great care and intelligence. The thermometer screen is very well exposed on a lawn in front of the museum, but a flagstone is placed underneath it. This I recommended should be covered with a mat, so as to reduce as far as possible the effect of radiated heat. The barometer is a Fortin, and the surface of the mercury was rather dull. Pipe water has sometimes been used to moisten the wet-bulb, but it was promised that in future only rain water or distilled water should be employed for this purpose.

Tealby, September 11th.—I spent a considerable time at this station and went into details of the work pretty fully with the observer, Rev. S. Lewin, M.A. The worst feature about the station is the frequent unpunctuality of the evening observations, but this I fear cannot be wholly avoided. The wet-bulb was dirty and not quite properly mounted.

York, September 7th.—The thermometer screen at this station is sheltered by trees growing to the south and south-west which cut off the sun's rays from the screen from about 1 p.m. In consequence, the afternoon maximum is, I believe, often missed. A much better site for the screen is available nearer the rain-gauge, and I recommend that efforts be made to effect a change. The screen is overcrowded with instruments and in consequence the maximum temperatures reported by telegraph are usually higher than those shown in the monthly reports, sometimes by as much as 3° or 4°. The wet-bulb was dirty. The rain-gauges are 1 foot 9 inches high, but being informed they had always been at the same height I recommended no change. Mr. Wright seemed anxious to do well.

Stations of the Third Order.

Alnwick Castle, September 3rd.—The temperatures hitherto sent us are from a large Six's thermometer hung outside the library window, 22 feet above the ground. I dismounted this instrument, and on testing it in water in the usual way, found it to be sensibly correct. There are however, other thermometers well exposed in a Stevenson screen in the garden, near the rain-gauge. I tested these also and found them to be excellent instruments. I was informed that there would probably be no difficulty in having the observations from these instruments sent to us instead of those from the "Six," and I strongly recommend that Mr. Willyams be asked to make this change. The temperatures at present reported certainly do not correctly represent the climate of the station. I requested that the long grass around the rain-gauge might be cut short, and this it was promised should be done.

Bawtry (Hesley Hall), September 10th.—The instruments used for the observations sent to the Office were in good order. Mr. Whittaker thinks of purchasing a sunshine recorder and an anemometer, and at his request, I advised as to the positions for these instruments.

Durham.—Everything was in good order at this station except that the rain-gauge was rather loose, and that the grass minimum thermometer had about 1° of separated spirit.

Market Rasen, September 11th.—This station supplies only rainfall observations. I found the rain-gauge loose and not quite level, but these

defects I corrected. The exposure is not quite satisfactory, the gauge being sheltered to some extent by the garden walls, &c.

North Allerton, September 6th.—This station supplies only rainfall observations. The rain-gauge in its present position is much sheltered, but there is a much better site available which I pointed out, and which I hope may be adopted. The measuring glass needs a correction of + ·01 inch, which Mr. Stead regularly applies.

Proposed Station.

Solihull, near Birmingham, September 12th.—This is a new station, not yet accepted by the Office; Mr. Boothroyd, the observer, has bought a good set of outdoor instruments, but has, as yet, no barometer. The exposure of the instruments is good, and I think the observations are very carefully taken. The thermometer screen at present is rather too near the house, and I selected a better site, to which it was promised the screen should be at once removed. Mr. Boothroyd cannot, at present, promise 9 p.m. observations, but I recommend the station be accepted as one of the Third Order, or for Weekly Weather Report purposes.

Barometer Comparisons, 1894.

Stations.	Inspector's Standard Barometer corrected (Adie, B. T. 779).	Reporting Barometer uncorrected.	Check Barometer uncorrected.	Reporting Barometer.		Remarks.
				Correction required to reduce to Inspector's Standard.	Correction hitherto used.	
Aysgarth - -	29·525	29·534	—	−·009	−·017	
Bawtry (Hesley Hall).	30·390	30·416	—	−·026	—	
Bramley - -	29·815	29·814	—	+·001	+·002	
Cronkbourne -	30·200	30·200	—	·000	·000	
Durham - -	29·795	29·788	—	+·007	−·002	
Gilcrux - -	29·905	29·790	—	+·115	+·068	Mercury had escaped during transit of inst. from Kew.
Heysham Hall -	30·120	30·123	—	−·002	−·005	
Manchester -	30·115	30·104	—	+·011	+·001	
North Shields -	30·055	30·038	30·028	+·017	—	
Prestwich -	29·840	29·830	—	+·010	·000	Comparison not very reliable owing to difficulty in hanging standard.
St. Helens -	30·180	30·188	—	−·008	−·009	
Seaham - -	29·995	29·996	—	−·001	−·014	
Sheffield - -	29·545	29·542	—	+·003	+·001	
Tealby - -	30·095	30·086	—	+·009	+·004	
York - -	29·990	29·984	29·986	+·006	+·007	

THERMOMETER COMPARISONS, 1894.

Corrections to be applied to the readings of—

STATIONS.	Standard corrected (Neg. B. T. 5012).	Dry Bulb.	Wet Bulb.	Spare Therm.	Max. Therm.	Min. Therm.	Grass Min.	REMARKS.
Alnwick Castle	—	—	—	—	0·0	0·0	—	Six's maximum and minimum.
	61·8	−0·5	−0·5	—	−0·8	−0·3	—	Instruments in Stevenson screen.
Aysgarth	52·8	—	—	—	—	0·0	—	
Bawtry (Hesley Hall)	57·3	−0·7	−0·2	—	−0·5	+0·1	—	
Bramley	60·1	+0·1	+0·1	—	−0·2	+1·1	—	
Cronkbourne	63·2	−0·5	−0·5	—	−0·2	+0·4	—	
Durham	53·7	−0·6	−0·6	—	−0·4	+0·4	+0·1	
Epsom	64·6	−0·2	−0·2	—	−0·1	−0·2	0·0	Before spirit was got back correction was + 1·4°.
Gilcrux	58·2	−0·2	−0·2	—	−0·3	−0·1	+0·2	
Heysham Hall	64·2	−0·4	−0·2	—	−0·3	+0·3	−0·1	
Manchester	57·5	+0·3	+0·2	—	+0·4	+0·4	+0·6	Earth thermometers, 1 ft. + 0·2; 4 ft. + 0·2.
North Allerton	56·2	—	—	—	−0·1	+0·7	—	Six's thermometer in garden stand.
North Shields	57·6	−0·3	0·0	—	−0·4	+0·8	—	
Prestwich	61·8	−0·3	−0·2	—	0·0	−0·1	—	
St. Helens	58·7	−0·2	−0·2	—	−0·1	+0·4	—	
Seaham	56·0	−0·7	−0·6	—	+0·4	+0·5	—	
Sheffield	53·4	−0·3	−0·4	—	−0·2	+0·1	—	
Solihull	56·8	−0·1	+0·1	—	+0·2	+0·8	—	
Tealby	59·6	−0·2	−0·2	−0·2	−1·2	+0·5	—	
York	54·3	−0·7	−0·6	—	−0·3	+0·4	—	Maximum and minimum thermometers for Second Order Return.
					−0·9	+0·4	—	Ditto for Telegraphic Reports.

(Signed) JOHN A. CURTIS.

INSPECTION of ANEMOMETERS at SCILLY and HOLYHEAD.

SIR, October 11th, 1894.

I BEG to submit herewith reports of my inspection last month of the anemometers at Scilly and Holyhead.

I am, &c.

(Signed) R. H. CURTIS.

R. H. Scott, Esq. F.R.S.

Scilly, September 4th-7th.—The anemometer had been partially dismounted on August 18th, and the pencils sent to Mr. Munro to have silver helices substituted for the brass ones hitherto used. (Minutes, p. 84, 1893.)

I found those portions of the instrument awaiting me at Scilly, Mr. Munro having returned them just prior to my arrival.

I at once got the pencils into their places, and by the evening of the 4th had the instrument again at work, deferring the overhaul of the bearings, &c., until the 5th.

I found the anemometer in a much better condition than it was in last year, and Mr. Hicks had apparently kept the bearings properly oiled, and followed the instructions which I gave him on that occasion. A mixture of paraffin and sperm oil which I then used had kept fluid and clean, and seemed to have answered very well; but the paint used last year had not stood well, and the whole of the exterior of the instrument again required to be painted, and this I requested should be done.

I dismounted the whole of the instrument, and carefully examined every part of it. A little adjusting was required with the new pencils, and I also made a small alteration in setting up the clock, by which its going was improved. Asbestoline was used to all the bearings, and the brake box was also filled with it, all the old oil being first removed. The observer complained that it was difficult to entirely prevent the rain from reaching the recording apparatus during south-easterly gales, and I therefore tried to improve the fitting of the door, and I think successfully.

Since the inspection the instrument has gone most satisfactorily. The silver helices answer very well indeed, the traces being black and distinct and thus far without the least sign of a faint trace, although some damp weather has been experienced.

Holyhead, September 18th–22nd.—The Robinson anemometer at work here was made by Beck, and has been in use since 1869. Some of the external parts have been renewed, and they are now all in good condition, but the recording portion of the instrument, besides being less conveniently arranged than in more modern instruments, is, after its 25 years' constant work, in a less satisfactory state.

The anemometer is, however, carefully looked after by Mr. Davies, the attendant, under Mr. Cotton's direction.

I had been asked to look specially for the cause of the occasional failure of the velocity trace, and also to try and ascertain the cause of a large time-error commonly shown by the traces. The first fault I found to be due to the construction of the instrument, but I was able to show the observer how to prevent it in future; whilst the second was due to the fact that the diameter of the cylinder was too small, and it could only be got over by causing the clock to gain about 10 minutes in the 24 hours, which was therefore done.

The entire instrument was dismounted and carefully examined and cleaned, and was left in good order.

I would beg to suggest that the recording portion of the instrument, including the clock and cylinder, should be returned to Munro for renewal and repair. The arrangement for raising the pencils is a bad one, and the cause of the occasional loss of trace; the time pricker is useless, and gives much trouble in setting the sheets; one of the pencils has been locally repaired, and the spiral is not quite true, and there is a large amount of "backlash" in the gearing. The rods connecting the reducing gear with the pencils are about 11 feet long, and I think it would be an improvement to cut them, and insert a Hook's joint in the middle of each; and some of the pivot holes of the clock require to be re-bushed.

The exterior portions of the anemometer need re-painting, and the cap which fits upon the top of the lantern, and which carries the pillar, required to be caulked; Mr. Cotton promised to have both done.

Before leaving Holyhead I noticed that the vane did not appear to be pointing truly into "the eye of the wind," and I made some experiments which I repeated with Mr. Cotton to test the truth of the supposition. There appeared to be no doubt that the vane was not correct, and that with a fresh wind from E. it pointed to E.N.E.; the velocity being about 30 miles per hour.

I found, however, that the tower, and the curved top of the lantern, caused some local eddies which I was not sure I could properly guard against without a better appliance than was ready to my hand; but Mr. Cotton has promised to test the matter again more fully with such an appliance shortly, and any alteration of the pencils has been deferred until that has been done.

Bridled Anemometer.

The bridled anemometer had not been dismounted for the purpose of being cleaned for several years, and some parts of it were, therefore, as might have been expected, in a very unsatisfactory state.

The oil in the upper box, containing a set of friction balls which carried the entire weight of the cups and the shaft, had become of the consistence of glue, and consequently the balls could not revolve and were useless for the purpose they were intended to serve. Congealed oil had also to be cut off the spindle, and in addition a good deal of oil, in a very sticky condition, was on the cords which carried the weights, at the part where they wound round the pulleys.

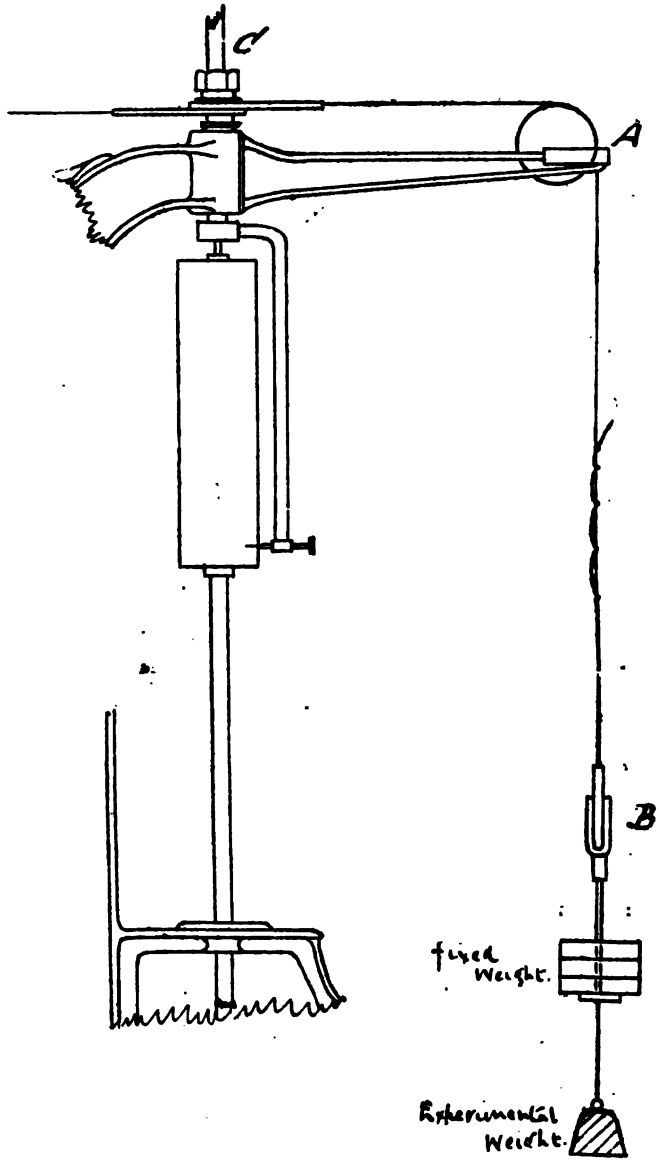
I first of all dismounted the instrument entirely, and had every part thoroughly cleaned and properly oiled. Some of the cups were badly dented, apparently by stones thrown by boys, and these I restored to their proper shape before replacing them. I found also that the friction balls in the upper bearing fitted too tightly, and by removing one ball I greatly improved the bearing.

After refitting the instrument, I proceeded to determine the true zero point of its scale. I was shown a mark upon the base of the cylinder which I was told had always been regarded as the zero, although it did not appear to me to be such a mark as an instrument maker would have put for the purpose. I think it most probable that originally a zero was omitted, and that the mark I was shown was made empirically by those who first had charge of the instrument; or it may even have been a casual mark found there and adopted as the zero. Before leaving I cut it into the metal more sharply.

The "snails" of the instrument having been designed to give a record of velocity, and not of pressure, any force applied to the spindle should move the pencil through a distance proportional to its square root.

I therefore placed upon the cylinder a sheet of paper, setting it to the mark used as zero, and then applied to the cord coming from the pulley upon the spindle (C) a series of weights, attaching them to the cord at a point about midway between the fixed pulley at the end of the arm (A) and the movable pulley (B) carrying the weights which form part of the instrument.

The method I adopted was as follows :—



The weights I used were ¼ lb., 1 lb., 4 lbs., 9 lbs., 16 lbs., and 25 lbs., which (with the exception of the ¼ lb. weight) should have given me a series of equal distances between the points at which the pencil came to rest. The experiment was made with the pulley on each side of the instrument separately. I took great care to apply the weight gradually, and to remove it in the same way; noting the point at which the pencil came to rest when the weight was removed as well as when it was applied. The cylinder was moved, between every operation so as to secure a distinct record of each.

The true zero should be five times the mean distance between the points, below the indication made by the pencil when the 25 lb. weight was applied; and this I find places it 0·7 inch below the mark hitherto used. In other words, the velocities hitherto measured are all about four miles too low.

I found that there is a very large amount of friction to be overcome in the instrument. The ¼ lb. weight produced no effect upon the pencil at all. When the 1 lb. weight was applied, no movement took place until the instrument had been well tapped, to overcome the friction. With the 4 lb. weight the pencil stopped at a point equal to about two miles on the scale below the position it assumed after being tapped; but with the heavier weights used, tapping produced no change at all in the position of the pencil.

The point to which the pencil returned, when the weights were removed, and without tapping the instrument, was practically always the same, and was equal to the position to which a pull of a little less than 2 lbs., applied to the spindle, should have raised it.

The cord used for supporting the working weights of the instrument is, without any doubt, a principal cause of the excessive friction. It is too thick for the pulley (a grooved one) upon which it is wound, and I could distinctly feel the "bite" of the double cord upon itself as the weights were removed. The effect was no doubt increased also by the fact that the cord was wet with oil. As I have already stated, I found the portion of the cord around and near the pulley covered with *sticky* oil, and although I removed this, and had it well washed with paraffin, it of course remained quite wet.

To remove this source of error, I beg to propose that a *wire* cord be substituted for the one now in use. I have obtained and tried two or three samples of wire cord, and have found one which possesses quite enough flexibility, with plenty of strength, for the purpose, and as it is of only about one-half the diameter of the present cord, there would be ample room for it on the pulleys. In addition to this, it could be kept clean from oil, which is always liable to find its way down the spindle from the bearings above.

I re-weighed and plainly marked all the weights used for loading the instrument; as also the movable pulleys, which form part of the load.

I found that the load hitherto used, and which amounted on both pulleys to 16 lbs. 14 ozs., was not distributed on both sides as equally as was desirable; and I therefore readjusted the weights so that the pull on each pulley should be practically the same. To do this, I was obliged to increase the total load to 18 lbs. 5 ozs., which will necessitate making another scale for future anemograms; this, however, can be readily done.

I also instructed the observer, in the case of exceptionally heavy gales, to increase the gross load to 25 lbs. 8 ozs., in order to prevent the spindle from making a complete revolution, which would render the record useless. The extra load will not be used for moderate gales, and is to be removed as soon as the weather moderates.

With regard to the time scale, I found that the reason why the hydraulic arrangement for lowering the cylinder could not be got to act less quickly (it now takes 20 minutes to run down) is because of leakage past the piston. This could be got over by re-packing; or it should be a very inexpensive matter to obtain from the clock a more open scale than that now in use, by adding another wheel and pinion to the present spindles, to lower the cylinder in six hours.

I took with me an arrangement to fix to the arm of the instrument, to enable a pen to be used for the trace instead of a pencil. I found that the wire arm for carrying the pen had been made so long that it vibrated too much, when moved by the wind, to allow of a steady trace being obtained. I had not time to alter it myself, but I explained what was required, and Mr. Cotton undertook to see the alteration made, when I think it will act satisfactorily.

(Signed) R. H. CURTIS.

REPORTS of INSPECTION of the OBSERVATORIES and ANEMOGRAPH STATIONS.

Kew Observatory, Richmond, Surrey,
October 16th, 1894.

DEAR MR. SCOTT,

I BEG to forward you the reports by Mr. Constable and myself on the observatories and anemometer stations we have inspected, with list of expenses, &c.

I am, &c.
(Signed) CHARLES CHREE.

Aberdeen Observatory, visited August 14th and 15th.—The anemometer has been recently painted. It was dismounted, cleaned, and freshly lubricated. The sheet showing results of orientation is attached. The barograph and thermograph clocks were oiled; they appeared clean and were working satisfactorily. The surface of the mercury in the standard barometer is a little dirty, but Mr. Boswell does not find this interfere with his readings. The thermograph screen has been protected with wire netting, according to recent instructions from the Meteorological Office. By comparison with my Kew standard in water at 60°, the following corrections were found for the thermometers:—

	Correction.
Dry standard, 597	−0·1
Wet „ 395	−0·7
Maximum, 1002	+0·1
Minimum, 5056	+0·3

The tube from the funnel to the receiver of the Beckley rain-gauge was in a somewhat patched condition; it was, however, intended, I was told, to fit a new tube shortly. Otherwise the instrument appeared in a satisfactory condition.

Glasgow Observatory, visited August 16th.—The anemometer was shifted in spring on to an iron framework, a little to the east of the dome, the cups being now some 3½ feet higher above the ground than previously. The instrument had been thoroughly seen to before its re-erection, and, as the lubricant appeared in good condition, I judged it unnecessary to dismount it. The sheet with the results of the orientation is attached. Advantage was taken of the presence in the observatory of an experienced clockmaker to have the anemograph, barograph, and thermograph clocks all thoroughly cleaned. A comparison with my Kew standard in water at 56½° gave the following corrections to the thermometers:—

	Correction.
Dry standard, 708	0°·0
Wet „ 711	+0·1
Maximum, 45904	+0·1
Minimum, 63942	+0·1

The Beckley rain-gauge appeared in good order. The assistant, however, pointed out that discharge occurred when by the trace considerably less than 0·2 inch rain had fallen. This appeared due to the pencil pressing too heavily on the paper, as on reducing the pressure fair results were obtained.

Kew Observatory.—All the self-recording instruments have been cleaned and attended to as usual.

(Signed) CHARLES CHREE.

Alnwick Castle, visited July 30th and August 1st.—The anemometer is kept well oiled, and an examination of the bevelled wheels and bearings of the shafting showed that their lubrication was properly attended to.

I found that a blade of one of the direction fans was broken off at the collar. This quite destroyed the balance of the fan and made the action very sluggish.

It had been proposed to have it removed from the spindle and sent to the maker to be put in proper order, and advantage was taken of my visit to dismount it for this purpose. The exposure of the instrument is very good, except from the N.E., where the wall at that angle of the tower rises above the other portions, and in high winds from that quarter must cause strong eddies and sudden oscillations in the direction.

Verification of the orientation is difficult owing to the very large amount of shafting employed, but I returned again on August 1st and further improved the general working of the instrument, and the orientation is now fairly good.

The advantage of having the exact times of changing entered on the sheets was pointed out, and it was readily agreed that these entries should be made on future curves.

North Shields, visited July 31st.—All exterior parts of the instrument which can be readily reached are kept carefully oiled, but owing to its position surmounting chimneys on the lighthouse it soon becomes covered with soot, &c., and I took the opportunity of obtaining regular assistance here, to entirely dismount and thoroughly overhaul every part, both exterior and interior.

The orientation was checked and found good, and the check marks will be found on the anemograph curve for July 31st–August 1st, which was sent to the Meteorological Office next day.

Captain Harrison was instructed to check the orientation regularly, and to duly forward the oriented sheets.

Yarmouth, visited August 3rd.—The anemometer appears to be systematically lubricated and attended to, and was in good order. All necessary cleaning, &c., was done, the orientation was found to be satisfactory and the check lines will be found on the anemograph curve for August 3rd–4th.

This sheet also shows three curves of complete revolutions of the velocity spiral, made after taking down the recording part, and improving the irregular marking which often occurs here.

Considerable time was given to this, and the action is now much better, but I am afraid there will always be a tendency to a recurrence of this uneven marking of the velocity trace. I drew attention to the absence of "pricker" marks, but to make these distinct with the present

pricker is difficult, as it is an old type made of soft steel, and the long arm bends over if much pressure is used, but I made it as firm as possible, and improved the point.

Falmouth, visited August 8th–10th.—The barograph and thermograph were in good order, but the clock escapements of both instruments required cleaning and fresh oiling, which was done, and all lenses carefully wiped.

The dials of both of these clocks have been re-plated since my last inspection, and are very much improved.

The "air-hole" of barograph was found quite clear.

Anemograph.—All exterior parts are kept well lubricated where possible, but I found the oil in the container in which the direction rollers' work was rather thick and dirty. The whole was removed, rollers, &c., washed in paraffin, and the container filled up with new asbestos lubricant.

All other parts were thoroughly overhauled, and clock, &c., cleaned.

The orientation was checked and found good.

The Beckley rain-gauge was also dismounted and cleaned.

The tops of some of the wooden stakes securing the check rain-gauge were found to have perished, these were replaced, and gauge carefully levelled.

The scale-values at present in use are—

Dry-bulb, upper zero	82°·5	Lower zero	16°·5
Wet „ „	81·0	„ „	18·0

and the values engraved on the ivory scales are—

Barograph 1 inch	= 1·525 inches.
Thermograph, dry-bulb 10°	= 0·734 „
„ wet „	No value given.

The thermometers were compared with my Kew standard at 62°, and the following corrections determined:—

Dry bulb, 383	= −0°·55
Wet „ 383	= −0·30
Maximum, M.O. 104	= −0·40
Minimum, M.O. 308	= 0·00

Radcliffe Observatory, Oxford, visited August 30th.—I examined the various self-recording meteorological instruments and clocks, and found everything in first-class order. The working of the exterior portions of the anemograph was also examined and proved very satisfactory.

The following corrections to the thermometers in use were determined by comparison with my standard at 60° F.:—

Thermograph, wet-bulb standard, 575	= −0°·15
„ dry „ „ 576	= −0·10
Wet-bulb thermometer, B.T. 1709	= −0·20
Dry „ „ „ 1710	= −0·20
Maximum „ M.O. 356	= −0·30
Minimum „ „ 363	= +0·10
Grass minimum „ 70852	= 0·00

(Signed) E. G. Constable.

Kew Observatory,
October 27th, 1894.

DEAR SIR,

I HAVE the honour to submit herewith my report to the Meteorological Council regarding their self-recording instruments at the observatories and anemograph stations inspected on the days named.

Stonyhurst, September 18th–19th.—Since the last inspection (September 25th–26th, 1823) the anemometer at this observatory has been refitted with new recording apparatus. My attention, however, was called by the Reverend W. Sidgreaves to the direction trace, which was not altogether satisfactory, being at times very faint. I accordingly dismounted the pencil, and found that the spindle upon which it turned was gritty and the oil rather thick; this was cleaned, and afterwards the action of the pencil was much improved.

The external parts of the instrument were examined and found to be well lubricated, and in every way satisfactory.

The orientation was duly examined.

Both the barograph and thermograph clocks were taken to pieces and cleaned, and new cords attached to the weights.

The clock dials having become tarnished through age, it was difficult to distinguish either the figures or graduations, and in consequence the observer experienced considerable difficulty in correctly setting the hand to time. Advantage was taken of the instruments being dismounted to remove the dials and send them to Mr. Munro for re-silvering.

Wire netting has been fitted to the thermograph screen in accordance with the instructions issued by the Council.

The rain-gauge was dismounted, and the new Stonyhurst lifter (which had recently been supplied by the Meteorological Office) fitted and adjusted to the instrument, the clock was also cleaned and a new line attached to the weight.

The various thermometers were compared with the Kew standard No. 682 and found to have the following corrections at 55° Fahr.:—

Dry-bulb standard, No. 619	0°0
Wet „ „ No. 382	−0·3
Maximum, 1525	0·0
Minimum, B.T., 501	+0·3

I also tested the maximum and minimum thermometers on the Glaisher stand and found the corrections to be—

Maximum, 7310	−0°5
Minimum, 48587	−0·1

Fleetwood, September 20th–21st.—Here the anemometer was working well, and on dismounting the external parts the oil was found in a satisfactory state; all parts of the instrument were cleaned, and the bearings replenished with fresh asbestos lubricant.

On examining the direction fans, two of the blades were discovered to be loose, but these I had re-soldered before leaving. The cup arms and stays did not show any signs of wear.

The clock was taken to pieces and cleaned, and the direction pencil also carefully examined and adjusted in order to remedy, if possible, the failure of the pencil in marking continuously. Some difficulty was experienced by the observer in clamping the cylinder, which would account for the differences shown between the curves and the times

noted of starting the instrument. I had an extra washer fitted to the clamp, so that the cylinder does not now slip, and at the same time a new pin was fitted to the driving wheel on the clock spindle.

On the 25th of March last, a flagstaff about 95 feet in height, was erected by the Town Commissioners on the "Mount," some 30 feet to the E.N.E. of the anemograph, but as the halliards are at least 25 feet above the cups, I do not think that the results will be materially affected when the wind is blowing from that direction.

The orientation was duly examined and found correct, and Mr. Gaulter was asked to forward from time to time an "Orientation" paper to the Meteorological Office.

Fort William, September 24th-25th.—All the instruments at this observatory were in good order.

The barograph and thermograph clocks were cleaned, as well as the lenses and condensers, and new lines fitted to the weights. Some little difficulty was experienced in adjusting the thermograph light stop, but by adding an additional weight to the lever, its action was much improved, and it has since worked satisfactorily.

The rain-gauge was examined, but as it had only quite recently been put together by Mr. Omond the clock did not require cleaning.

In order to slightly extend the range of the float, a little mercury was added to the cistern, and the pencil readjusted.

Squeezes of both the self-recording and check rain-gauge funnels were taken, and are sent herewith.

The following were found to be the corrections at 55° Fahr. to the various thermometers in use:—

Dry-bulb standard, 671 - - -	0°0
Wet „ „ 672 - - -	−0·2
Maximum, 1092 - - -	+0·1
Minimum, 1822 - - -	+0·8
Barograph thermometer, K.O., 6–90 -	−2·1
Attached thermometer (to the standard barometer), No. 72222 - -	−0·2

As the minimum thermometer read suspiciously low it was taken off the scale, and the chamber warmed by means of a lamp. It was then placed in a vertical position for some two hours, when the following correction was determined:—

Minimum, No. 1322 - - -	+0°4

Deerness, Orkney, September 28th–29th.—The anemograph here was found to be maintained in excellent order, the bearings of all parts being well oiled and in good condition.

Mr. Spence reported that the external parts of the anemograph as well as the hut had been recently painted.

I had the instrument dismounted and carefully examined the cup, arms, and fans, but these did not show any marked signs of wear. Two oil screws, however, are missing.

After cleaning and replenishing the bearings with fresh asbestos lubricant the orientation was examined, and the observer was instructed to orientate the instrument once a month and forward the results to the Meteorological Office.

The clock was also cleaned and the whole of the recording apparatus dismounted and attended to.

Armagh, October 5th–6th.—At this observatory the anemograph was much in need of cleaning, as it had not been dismounted since the spring of 1892.

All the external portions of the instrument were taken to pieces and the thick oil removed, after which asbestos lubricant was supplied to all the bearings. The recording pencils were also examined and cleaned, and endeavours were made to improve the action of the velocity pencil, which does not mark satisfactorily in light winds, but I fear the defect is inherent in the instrument. The clock having comparatively recently been cleaned it only required oiling, but Dr. Dreyer stated that it occasionally stopped. On examination, I found that it had been geared up too tightly to the recording cylinder, this was put right.

The orientation was tested and found correct, and the sheet is sent with this report.

The rain-gauge was entirely dismounted, the clock taken to pieces and cleaned, and a new cord attached to the weight.

Mountjoy Barracks, Dublin, October 8th–9th.—The lubrication of the external parts of the anemograph was not satisfactory, the instrument not having been dismounted since March 1892, the oil had become viscous and the friction balls much impeded, so that all parts had to be taken to pieces and well cleaned with paraffin.

The box containing the oil dampers, to which the direction shaft is geared, was also taken to pieces and the reservoir filled with asbestos lubricant, afterwards the apertures at the ends of the brass cylinders through which the oil passes were carefully adjusted, so as to keep the vane steady to the wind's direction.

The clock was cleaned and the orientation tested, and the observer was instructed to perform the operation monthly and send the result to the Meteorological Office.

The time of starting and stopping the instrument noted on the sheets is *local* and not G.M.T.

Valencia, October 11th–13th.—As in the case of Armagh and Mountjoy, the instruments here greatly needed cleaning, not having been dismounted since their erection in March 1892, at the new observatory.

The clocks of both barograph and thermograph were overhauled and cleaned, and new lines attached to the weights, also the lenses, condensers, &c. received the usual attention, and the position of the zero dots was changed to the winter values.

Mr. Cullum drew my attention to some stray light which fell upon the thermograph cylinder. On examination I found that it came through a certain part of the wet-bulb tube, the black of which had flaked off. This part was re-blackened and some cardboard shields fitted to both lenses as a further protection to keep out reflected light. Subsequent photographic sheets showed that the stray light had been effectually blocked out.

In both instruments special attention was given to the light shutters, which had not been working well. These were cleaned and the lever weights carefully adjusted, after which their action was greatly improved, and it is hoped that they will now work satisfactorily.

The thermometers were compared and found to require the following corrections at 55° Faht.:—

Dry-bulb standard, 399	−0°·7
Wet „ „ 473	−0·3
Maximum, M.O., 1003	0·0
Minimum „ 2497	+0·4*
Standard barometer, attached thermometer, 71062	−0·1
Barograph thermometer (no number)	−2·0

*As the correction to the minimum thermometer was rather large the tube was dismounted and the chamber end warmed over a lamp. It was then placed in a vertical position for some time, when the following correction was obtained:—

Minimum, 2497	0°·0

Wire netting has been fitted to the thermograph screen in accordance with the instructions issued by the Meteorological Council.

The rain-gauge was examined and a slight adjustment made in the fall of the float.

On dismounting the anemograph, I found that the oil in the direction bearing had become very viscous, this was removed and fresh asbestos lubricant added. The other parts of the instrument were also cleaned, but we were unable to disconnect the cups from the velocity spindle, as the collar through which the spindle passes had become so incrusted with rust, &c. After repeated efforts, the cups and spindle were taken to the local blacksmith, who succeeded, after making the collar and shaft red hot, in removing the cups.

The instrument was put together and re-started between 7 and 8 p.m., but the orientation was not examined till the next morning (October 13), when it was found correct.

The recording parts were generally examined, and the pencil bearings oiled.

The direction fans are a good deal corroded and new ones will be required before long. I would respectfully suggest that, perhaps, copper fans would be an improvement, as sheet iron so rapidly corrodes.

(Signed) T. W. Baker.

R. H. Scott, Esq., F.R.S.

APPENDIX VI.

Method of Dealing with Telegraphic Weather Intelligence.

The operations connected with the preparation and issue of the Forecasts and Storm Warnings have not undergone any material change. Full details will be found in Appendix X. to the Report for 1891.

Daily Weather Report.

The Office receives, when the telegraphic communications are perfect, sixty reports each morning, seventeen each afternoon (except on Sundays), and twenty-nine each evening, the arrangement of which is explained in the Annual Reports for recent years.

The change made during last year in the Daily Weather Report, by the insertion of Reports from the Azores (forwarded by the courtesy of the Portuguese Meteorological Authorities), is still in force. The Report fills four large quarto pages, as it has for several years past.

The standing portions (maps, &c.) are printed in blue, and the information for each day is in black.

The Monthly "Correction and Addition List" is published as before.

The subscription for the Report is—

For delivery by hand, where feasible, £2 *per annum;*
„ *by book post* £1 „

An early issue of MS. copies of the observations and remarks can be supplied at the rate of 2*l.* 10*s.* per annum. Arrangements can also be made for the supply of charts drawn from the 8h. a.m. or 6h. p.m. observations, such as appear in the "Times."

Weekly Weather Report.

The Weekly Weather Report, which has appeared since February 1878, and was re-arranged at the commencement of 1890, is prepared for the calendar week, Sunday to Saturday. It is published regularly on Thursdays and is illustrated by three maps for each day. These, like the Daily Reports, show the outline of the land and sea in blue, but the information in black. The maps show (1) for 8 a.m., the temperature, weather, and sea disturbance; and (2) for 8 a.m. and 6 p.m., the distribution of pressure and the winds, over, and on the coasts of, Europe. The information on the first and second pages of each report consists of observations of Temperature and Rainfall made at 77 stations, the individual values for which are given on the second page of the Report, and of Sunshine records taken at 49 stations.

Tables of *Accumulated Temperature*, designed to give persons engaged in agriculture better means of estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer, are still published on the first and second pages, and show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively, of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard, or *base temperature*. The base value adopted is 42° Fahr.

Accumulated Temperature is expressed in *Day-degrees;* a Day-degree signifying 1° F. of excess or defect of temperature above or

below the base (42° F.) continued for 24 hours, or any other number of degrees for an inversely proportional number of hours. An explanation of the rules by which it is obtained will be found in the Annual Report for 1889, while full details as to the facts on which the rules are founded are published in Appendix II. to the Quarterly Weather Report for 1878.

In addition to the reports from the Telegraphic Reporting Stations, and the returns from certain self-recording Observatories, weekly schedules from 56 volunteer observers are used, the names of the stations and observers being given in Appendix XI., p. 84.

An early copy of the MS. of the report is prepared on Tuesday in every week, and the summary on its first page is sent to several papers on that evening; the printed copies of the complete report are ready for sale on Thursday afternoon.

Appendices, &c. to the Weekly Weather Reports.

Two Appendices, I. and II., have appeared, similar to those for recent years. The Monthly Summary Supplement gives the average values for Pressure, Temperature, Rainfall, and Bright Sunshine of the current month, and the difference between these values and the means for the corresponding months in a long series of years, together with the number of days on which rain, snow, hail, thunder &c., &c. occurred, and the number of days on which the wind blew from the eight principal points of the compass.

Issue of Forecasts.

There was an important development in this work in 1894, the Board of Agriculture having forwarded the 3.30 p.m. daily forecasts to the rural parts of six counties as explained at p. 12.

Remarks on the actual state of the weather, and Forecasts *for not more than one day in advance*, are prepared at the Meteorological Office as under:—

*On Week Days.**

(1.) At 11 a.m. (from the morning reports), for the 24 hours ending at Noon on the day following the date of issue. These are intended especially for the early editions of the evening papers, for the clubs, and for exhibition at certain selected stations. See page 9.

(2.) At 3.30 p.m. (from the morning and afternoon reports), for the day following that of issue. This set of forecasts is not intended for publication in newspapers, but a copy is exhibited regularly at the door of the Meteorological Office, and during the Hay Harvest they were telegraphed to about 28 well-known agriculturists, to be made known in their neighbourhoods (see p. 10), and to the Board of Agriculture for transmission to certain counties in England (see p. 12).

(3.) At 8.30 p.m. (from the 8 a.m., 2 p.m., and 6 p.m. reports), for the civil day following that of issue. These are supplied gratis to any newspaper or news agency which may apply for them, and send for them regularly. A very large number of the more important papers and news agencies avail themselves of this advantage.

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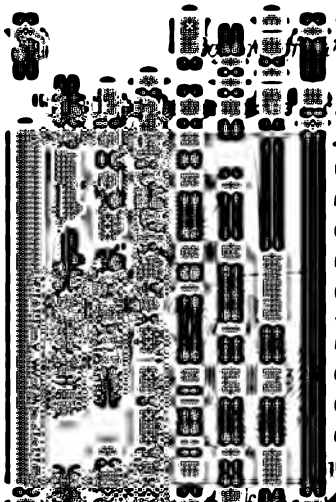
* Good Friday and Christmas Day are reckoned as Sundays.



al Council.

istricts :—

NORTH.
EAST.
N.E.
EAST.
OUNTIES.
SOUTH (and English
WEST (with Isle of Man).
N.W. (with North Wales).
S.W. (with South Wales).
ORTH.
OUTH.

the doors of the Meteoro-
eek days,* for the inspection
n, are communicated under
n which is not substantially

front of the Office showing
, and sea disturbance at six
oasts. The stations selected
illy, Holyhead, and Valencia
e those for 8 a.m. and 2 p.m.
g changed at about 9h. 45m.
easily read from the street.

son can be supplied with a
ach week day,* on payment
am, or 2*s.* 6*d.* per official
the cost of transmission ; the
s., by *book* post, 5*s.* 9*d.*, per

cts and for any of the hours
aph daily, on payment of 3*d.*
o the cost of telegraphy.
wn up at 11 a.m., for all the
subscription of ten shillings
o Clubs situated in or near
de for delivery at a greater

TS, OR FOR PUBLIC USE.—
ssion of Forecasts for these
harged for an official quarter
f the telegrams.

S AT LOCAL POST OFFICES.
ition of Forecasts at Local
f the persons to whom they
d instead of being delivered

transmitted by post are sent

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eckoned as Sundays.

Inquiries as to the Weather.

Inquiries Personally or by Messenger.—Any person applying at the Meteorological Office between 11 a.m. and 8 p.m. on week days, and between 7 p.m. and 8 p.m. on Sundays,* can be supplied, in writing, with the latest information in the possession of the Office and with the latest forecast issued for any specified district, on payment of one shilling for each inquiry.

Inquiries by Letter.—Application may be made by letter, enclosing thirteen pence in stamps if the reply is to be *by post*, and one shilling in stamps, in addition to the cost of the reply (consisting of ten words, exclusive of the address) if the reply is to be *by telegraph*.

Inquiries by Telegraph.—Any person may obtain *by telegraph* from the Meteorological Office the latest information as to the weather in any district of the United Kingdom by payment of a fee of one shilling in addition to the cost of a telegram and reply to any post office. The telegram containing the inquiry must be addressed as follows:

To

Weather,

London.

The payment for the reply should be for at least ten words in addition to the address.

Application may also be made for similar information to be sent either *by telegraph* or *post* on some future specified day.

Checking of Forecasts and Storm Warnings.

The forecasts and storm warnings issued by the Office are carefully checked by being compared with the conditions actually experienced during the time to which they refer. The method adopted was fully explained in the Annual Report for 1891, and the results for 1894 will be found on pp. 10 and 14.

In order to render the information in the possession of the Office as to the weather experienced on our coasts still more complete, the Council have, as in preceding years, obtained from the various Lighthouse Boards the original log-books from some of the most exposed light-ships and lighthouses. They again express their cordial thanks for the co-operation so readily granted to them by these Boards.

* Good Friday and Christmas Day are reckoned as Sundays.

APPENDIX VII.

REPORT ON THE COMPARISON OF THE FORECASTS ISSUED AT 8h. 30m. p.m. WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1894 to March 1895. The results are for the United Kingdom as a whole.

The letters used have the following signification :—

a = complete success. | **c** = partial failure.
b = partial (more than half) success. | **d** = total failure.

The checking has been conducted on the same system as that employed in previous years, *i.e.*, each forecast has been considered under the separate headings of "Wind" and "Weather," but the results of the 8.30 p.m. Forecasts only are here published.

The first column gives the per-centage of success in "Wind," the second in "Weather," and the third the average of the other two.

The Summary for the various districts is given at page 10.

Months.		Per-centages.				Months.		Per-centages.			
		Wind.	Weather.	Average.	a + b.			Wind.	Weather.	Average.	a + b.
April	a	51	59	55	82	October	a	53	59	56	81
	b	29	25	27			b	25	24	25	
	c	15	13	14			c	15	10	12	
	d	5	3	4			d	7	7	7	
May	a	53	68	61	82	November	a	53	59	56	85
	b	25	18	21			b	28	29	29	
	c	13	8	11			c	13	10	11	
	d	9	6	7			d	6	2	4	
June	a	52	61	57	80	December	a	50	56	53	82
	b	27	20	23			b	26	32	29	
	c	14	12	13			c	13	7	10	
	d	7	7	7			d	11	5	8	
July	a	55	58	57	82	January	a	43	63	53	83
	b	28	23	25			b	32	27	30	
	c	9	12	11			c	19	6	12	
	d	8	7	7			d	6	4	5	
August	a	62	64	63	89	February	a	39	43	41	78
	b	27	24	26			b	40	33	37	
	c	11	6	8			c	14	12	13	
	d	0	6	3			d	7	12	9	
September	a	64	61	63	87	March	a	47	65	56	84
	b	22	26	24			b	31	25	28	
	c	13	11	12			c	17	6	12	
	d	1	2	1			d	5	4	4	

[*Continued.*

		Per-centages.			
		Wind.	Weather.	Average.	a + b.
The entire year	a	52	60	56	83
	b	28	26	27	
	c	14	9	12	
	d	6	5	5	

APPENDIX VIII.

Telegraphic Weather Intelligence.

The Meteorological Office issues notices of atmospherical disturbances on or near the coasts of the British Islands (free of charge) to ports and fishing stations recommended by responsible local authorities.

The fact that one of these notices has been received at any station is made known by hoisting a black canvas cone, 3 feet high and 3 feet wide at base, which has the appearance of a triangle when hoisted. The telegram directing the cone to be hoisted should be exhibited near the signal staff.

At dusk, whenever a signal ought to be flying if it were daylight, a night signal, consisting of three lanterns hung on a triangular frame, may be hoisted in place of the cone.

The Meteorological Office supplies the canvas cone, but does not undertake to supply the lanterns. In all cases the local authorities must undertake the charges incidental to the hoisting of the signal, such as flagstaff and gear, oil, &c., and also as to the keeping of the apparatus in repair, painting, &c.

The following is a list of the stations at which the signals are hoisted :—

[*Continued.*

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.E.	IRELAND, S.W.	ENGLAND, S.W.	ENGLAND, E.
Lerwick.	New Ross.	Scilly.	Harwich.
Scalloway.	Dunmore, East.	St. Sennen.	Ipswich.
Dunrossness.	Dungarvan.	Newlyn, West.	Southwold.
Stromness.	Youghal.	Penzance.	Yarmouth.
Kirkwall.	Queenstown.	The Lizard.	Cromer.
Holborn Head.	Passage.	Falmouth.	Sheringham.
Dunnet Head.	Cork.	Pendennis.	Lynn.
Wick.	Kinsale.	Mevagissey.	Sutton Bridge.
Avoch.	Do. (Old Head).	Devonport.	
Inverness.	Castletownshend.	Plymouth.	
Nairn.	Brow Head.	Prawle Point.	
Burghead.	Tralee.	Teignmouth.	
Lossiemouth.	Limerick.	Exmouth.	
Buckie.	Galway.		
Port Knockie.			
Cullen.			
Portsoy.	IRELAND, N.W.		
Banff.			
Fraserburgh.	Rathmullan.		
Peterhead.	Malin Head.	ENGLAND, S.	ENGLAND, N.E.
Aberdeen.	Portrush.		
	Port Ballintrae.	Guernsey.	Boston.
		St. Helier's (Jersey).	Cleethorpes.
	IRISH SEA.	Gorey (Jersey).	Grimsby.
SCOTLAND, E.	Belfast.	Weymouth.	Goole.
	Birr Point.	Poole.	Hull.
Stonehaven.	Donaghadee.	Cowes.	Bridlington Quay.
Montrose.	Howth.	Ryde.	Flamborough Head.
Broughty Ferry.	Kingstown.	St. Catherine's Point.	Filey.
Dundee.	Ramsey (I. of M.).	Portsmouth.	Whitby.
St. Andrews.	Douglas „	Southampton.	Redcar.
Anstruther.	Castletown „	Hamble.	Middlesborough.
Pittenweem.	Silloth.	Littlehampton.	West Hartlepool.
Wemyss, West.	Maryport.	Brighton.	Sunderland.
Burntisland.	Workington.	Newhaven.	South Shields.
Grangemouth.	Whitehaven.		Tynemouth.
Bo'ness.	Barrow.		Cullercoats.
Granton.	Morecambe.		Berwick-on-Tweed.
Newhaven.	Fleetwood.		
Leith.	Blackpool.		
Fisherrow.	Lytham.		
Dunbar.	Preston.	ENGLAND, S.E.	
Cockburnspath.	Southport.		
St. Abb's Head.	Liverpool.	Eastbourne.	
Eyemouth.	Runcorn.	Hastings.	
	Connah's Quay.	Rye.	
	Penmaenmawr.	Sandgate.	
	Port Penrhyn.	Folkestone.	
	Port Dinorwic.	Dover.	
	Carnarvon.	Ramsgate.	
	Holyhead.	North Foreland.	
		Margate.	
		Faversham.	
	ST. GEORGE'S CHANNEL.	Sheerness.	
		Chatham.	
	Aberystwyth.		
	Milford.		

[*Continued.*

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.W.	BRISTOL CHANNEL.		
Stornoway.	Pembrey.		
Port of Ness (Island of Lewis).	Llanelly.		
	Swansea.		
	Briton Ferry		
	Porthcawl.		
	Penarth.		
	Cardiff.		
	Do. Barry Dock.		
SCOTLAND, W.	Newport.		
Glasgow.	Weston-super-Mare.		
Greenock.	Burnham.		
Rothesay.	Bridgewater.		
Campbelton.	Ilfracombe.		
Girvan.	Lundy Island.		
Ballantrae.	Barnstaple.		
	Appledore.		
	Boscastle.		
	Port Isaac.		
	Newquay.		
	Hayle.		
	St. Ives.		

APPENDIX IX.

Fishery Barometers.

List of Places supplied with Fishery Barometers.

Shetland Isles.—Balta Sound, Uya Sound, Burravoe, Nesting, Lerwick, Sandsair, Scalloway, Symbister.

Orkney Isles.—Westray, Papa, Burray, Kirkwall.

Scotland, east coast.—Duncansbay, Freswick, Auchengill, Keiss, Ackergill, Staxigoe, Wick, Lybster, Dunbeath, Portmahomack, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy, Whitehills, Gardenstown, Rosehearty, Pitullie, Fraserburgh, Inverallochy, Pointlaw, Findon, Portlethen, Skateraw, Stonehaven, Arbroath, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance, Burntisland, Newhaven.

England, east coast.—Berwick, North Shields, South Shields, Sunderland, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn (2), Wells, Gorleston, Lowestoft, Orford Haven, Woodbridge Haven, Harwich, Brightlingsea, West Mersea, Maldon, Margate, Deal, Kingsdown, Dover.

England, south coast.—Bognor, Ryde, Bembridge, Brixton, Atherfield, Ventnor, Yarmouth (Isle of Wight), Gorey (Jersey), Haslar Hospital, Poole, Weymouth, Portland, Budleigh Salterton, Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscatho, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn (2), Mousehole.

England, south-west coast.—St. Ives, Hayle, Port Isaac, Boscastle, Bideford, Burnham, Highbridge, Weston-super-Mare.

Wales.—Briton Ferry, Swansea, Angle, Milford, Aberystwyth, Nevin, Carnarvon.

England, north-west coast.—Fleetwood, Morecambe, Maryport.

Isle of Man.—Douglas, Port St. Mary, Peel (2).

Scotland, south-west coast.—Port Patrick, Stranraer.

Ireland, east coast.—Cushendall, Belfast, Bangor, Groomsport, Donaghadee, Ardglass, Warren Point, Carlingford, Greenore, Dundalk, Malahide, Howth, Kingstown (2), Bray, Wicklow.

Ireland, south coast.—Dunmore East, Dungarvan, Crosshaven, Kinsale, Union Hall, Castletownsend, Baltimore, Schull (2), Crookhaven, Castletown (Berehaven), Lawrence Cove, Ballydonegan, Ballycrovane.

Ireland, west coast.—Valencia, Dingle, Tralee, Tarbert, Kilcredane, Kilronan, Spiddal, Cleggan, Elly Bay, Ballyglass, Ballycastle (Co. Mayo), Donegal, Tribane, Killybegs, Teelin, Malinmore, Portnoo, Burton Port, Kincaslagh, Bunbeg.

Ireland, north coast.—Dunfanaghy, Rathmullen, Buncrana, Malin Head, Moville, Greencastle, Portstewart, Portrush, Port Ballintrae, Ballycastle (Co. Antrim).

Scotland, west coast.—Tarbert (Loch Fyne), Campbeltown, Carradale, Portree, Armadale (Isle of Skye), Isle of Soay, Plockton, Gruinard, Ullapool, East Mey, Stroma.

Hebrides.—Stornoway, Portnaguiran, Obb, Valtos, Carloway, Ness.

APPENDIX X.

Methods followed in dealing with Meteorological Returns from Land Stations in the British Isles.

These stations are of seven classes, as stated on page 17.

I.—*Observatories continuously observing all the Meteorological Elements.*

Returns from observatories.

Hourly measurements of the curves obtained from the self-recording instruments at the observatories of the Office are made by the observers at each station, on printed forms supplied for the purpose, which, together with the curves, are forwarded to the Office weekly. They comprise measurements of the barograms, of the dry bulb and wet-bulb thermograms, of the anemograms, and of the rain-gauge curves.

Examination of returns.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the revised regulations which have been adopted to secure this end will be found in the Report of the Office for 1890. They comprise rules for the guidance of observers, as well as of the assistants charged with the examination of the work at the Office. Attention need be called here to only two of these rules, viz., (*a*) the use of subsidiary sheets on which are entered the results of a second set of measurements of the curves made after, and quite independently of, the first set, and with a different form of scale, the two sets of measurements being afterwards compared together, and any differences found inquired into and set right; and (*b*) the re-measurements of the curve made by the assistants at the Meteorological Office, and which always amount to 40, and in doubtful cases to many more, per month, for each element.

Results of examination and report to Council.

The attention of the observers is always drawn to such errors as may be detected, and to any failures in the continuity of the curves arising from failure of the light, stoppage of the clock, defective photography, faulty action of the wet-bulb thermometer, &c.; a report containing the results of the examination of each Observatory being also submitted to the Council periodically. The curves and tabulations are eventually bound and stored in the Office.

General supervision of observatory work.

In connexion with this work should be mentioned the general watch which has to be kept over the working of the observatories and of the instruments, not only to secure uniformity amongst them and observance of rules, but also to guard against small changes which are liable to occur at certain times, especially with the thermographs, and which may affect the scale-values of the instrument or the datum lines used for the tabulation of the curves. About twice a year this work calls for special examination, entailing some considerable time and occasionally the engraving of new scales for measuring the curves.

Method of dealing with the Numerical Results from the Self-recording Observatories.

Interpolations.

In dealing with the tabulations the first step is to go over the sheets and fill up by interpolation, wherever possible, any gaps or breaks in the continuity of the record.

The records having been made as complete as possible, are then used for the calculation of daily and hourly mean values, for periods of five days, calendar months, and for the year; which, together with other data obtained from the same source, are published under the title of "Hourly Means of the Readings obtained from the Self-recording "Instruments at the Five Observatories under the Meteorological "Council." The volume for 1891 is almost ready for issue, and that for the year 1892 is also in the press. See p. 19.

II.—*Anemographic Stations at which the Wind is recorded continuously.*

The anemograms received from Alnwick Castle, Deerness, Dublin, Fleetwood, Holyhead, North Shields, Scilly, and Yarmouth are regularly examined and tabulated in the Office, and the sheets bound up in volumes. Besides special inquiries on legal and other points that from time to time arise, and in which these documents are of high importance, the tabulations are always employed in the preparation of the various Reports issued by the Office. They are also regularly used in the checking of the Storm Warnings.

III.—*Barograph Stations at which the Atmospheric Pressure is continuously recorded.*

These stations are for the most part either telegraphic reporting stations or stations of the second order. The instrument in most general use is Richard's self-recording aneroid. At the telegraphic stations the record is first used to inform the observers as to the changes which have occurred since the last observing hour, and these changes, when large, are reported by wire to London, and are used in preparing the forecasts. The curves themselves are forwarded to the Office weekly and are stored for future use.

IV.—*Sunshine Stations at which the duration of Bright Sunshine is continuously recorded.*

Sunshine records.

The daily records of sunshine which are now received from 48 Stations in the British Islands are examined generally, to guard against accidental changes in the adjustment of the instruments. Notes explaining any omission or accidental defect are added to the cards, if required, and after their receipt has been acknowledged, they are duly stamped and dated and then stored in the Office.

Weekly totals.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VI., and for those stations which are also Stations of the Second Order the monthly totals of bright sunshine in hours, together with the per-centages of its possible duration, are published as Part IV. of "Returns from Stations of the Second Order." Hourly tabulations are made of the returns from the observatories, and the mean hourly amounts are published in the volumes of "Hourly Means." A table showing the daily amount of sunshine at Bunhill Row, one of the London stations, is also prepared quarterly for the Royal Meteorological Society.

V.—*Telegraphic Reporting Stations.*

These are 30 in number, and the particulars as to the observations taken at them, and the methods adopted in dealing with them, will be found fully detailed in Appendix VII. to the Report for 1888–89.

VI.—*Land Stations of the Second Order.*

Origin and progress of system.

Ever since the year 1866 returns of more or less completeness have been received from land stations in the United Kingdom. In that year there was only one station, but by 1871 the number had increased to 15, and five years later to 49, including 14 stations belonging to the Royal Meteorological Society, copies of the returns from which were sent to the Office under a special arrangement with the Society.

At the end of March 1895 the total number of stations was 74, including 15 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society.

The stations are distributed as follows: 36 in England, 3 in Wales, 23 in Scotland, and 12 in Ireland.

The methods followed with regard to the examination and publishing of these returns have been fully detailed in previous reports, and need not now be repeated. The changes introduced into the volume for 1886 have been continued in those for later years. These refer to the barometer readings, which are now given at station-level instead of being reduced to the mean sea-level; and to the humidity, where the depression of wet-bulb is shown, the international forms A and B being modified accordingly.

The volume for 1891 contains returns from 70 stations.

Arrangements have been made under which it is hoped that the arrears of this publication will be rapidly reduced.

Reports from the Irish stations are regularly supplied to the Registrar-General for Ireland for his Weekly and Quarterly Returns.

New stations.

When an application for the adoption of a new station is received, a schedule is forwarded to the observer containing a series of questions as to the outfit of the station, the exposure of the instruments, and the influence likely to be exerted on their indications by surrounding objects, such as houses and trees. Only mercurial barometers are accepted, and only such as have been duly verified. All thermometers must have been tested at Kew. A plan of the station, showing the positions of the instruments with regard to neighbouring objects, is also required.

On the return of this schedule the answers are considered, and, where necessary, alterations are advised.

If, however, the existing arrangements are satisfactory, tables for reducing the barometer readings to 32° Fahrenheit at mean sea-level are prepared and duplicates sent to the observer, together with a set of Hygrometrical Tables, and a copy of "Instructions in the Use of Meteorological Instruments."

The first returns are compared and examined with special care, and a report of the result of the examination is forwarded to the observer, with instructions how best to improve and complete the returns.

There are still many parts of the British Islands very poorly represented by the existing stations, and any information for these districts would be valuable.

VII.—*Land Stations of the Third Order.*

These are 53 in number. The information supplied from them is, in some cases, similar to that supplied by a station of the second order, but taken only once daily, or at irregular hours, or perhaps less complete. At other stations less detail is given; for instance, 25 stations furnish only the daily rainfall. All the information thus afforded is utilised in some way or other, though it is not all included in the Office publications. The rainfall values are copied and supplied to Mr. Symons, F.R.S., for publication in "British Rainfall."

Inspection.

The Stations of the Second Order are regularly inspected, the attention of the inspector being directed by the Office to any special point which may require investigation.

List of Stations.

In Appendix XI., page 84, is given a complete list of the stations supplying information to the Office.

APPENDIX XI.

LIST of STATIONS in the BRITISH ISLANDS from which INFORMATION has been received at the METEOROLOGICAL OFFICE during the year ending March 31st 1895.

The Stations marked "S" are in connexion with the Scottish Meteorological Society, and those marked "R" are in connexion with the Royal Meteorological Society. The returns from these Stations are received by the Office under an arrangement which will be found detailed in previous reports.

In certain cases where the position of the actual station at which the Observations have been taken is not generally known, and could not be readily identified, the name of some village or town near has been inserted, with the name of the station following within brackets.

The nature of the information received from each station is indicated by letters as follows :—

A. *Observatories.*—Continuous record of pressure, temperature, wind, sunshine and rain, with eye observations of the amount, form, and motion of the clouds, and notes on the weather.

B. *Anemograph Stations.*—Continuous record of the direction and velocity (or force) of the wind.

C. *Barograph Stations.*—Continuous record of pressure.

D. *Second Order Stations.*—Regular observations at 9 a.m. and 9 p.m. each day, local time, of pressure, temperature (dry-bulb and wet-bulb), wind, cloud, and weather, with the daily maxima and minima of temperature, the daily rainfall, and general remarks on the weather.

E. *Second Order Stations.*—Monthly means and summaries on Form B. of observations taken at 9 a m. and 9 p.m., each day as above.

F. *Climatological Stations.*—The maximum and minimum temperature and the rainfall for each day, with remarks on the weather. This information is sent to the Meteorological Office each week for use in the "Weekly Weather Report."

G. *Third Order Stations.*—Observations of the same kind as at Second Order Stations, but either :—

(*a*) less full.
(*b*) taken only once daily.
(*c*) taken at irregular hours.

R. *Rainfall Stations.*—Daily observations of the amount of rainfall, with remarks on the weather.

S. *Sunshine Stations.*—Continuous record of bright sunshine.

T. *Telegraphic Stations.*—Regular observations at 8 a m. and 6 p.m. G.M.T. (and from some stations at 2 p.m. in addition), of pressure, temperature, wind and weather, with the daily maxima and minima of temperature, the daily rainfall, and, where possible, the sea-disturbance at 8 a m. each day and the daily amount of bright sunshine. This information is sent to the Meteorological Office each day by telegraph, for use in the "Daily Weather Report" and, as required, for use in the "Weekly Weather Report."

W. *Sea-temperature.*—Daily observations of the temperature of the sea water.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
Aberdeen (Observatory)	57° 10′ N.	2° 6′ W.	46	Prof. C. Niven	A. T. C.
„ (Cove Bay)	57 9 „	2 5 „	—	Coastguard	W.
Alnwick Castle	55 25 „	1 43 „	210	Humphry Willyams, for the Duke of Northumberland.	B. F.
Ardrossan, Ayrshire	55 38 „	4 50 „	15	J. W. Mayes	T.
Arlington Court, Barnstaple.	51 8 „	3 58 „	613	W. Stewart, for Lady Chichester.	F.
Armagh Observatory	54 21 „	6 39 „	196	J. L. E. Dreyer	B.D.F.S.
Arran, North, Galway	53 6 „	9 40 „	—	Coastguard	G. W.
Aysgarth Vicarage, Yorks	54 18 „	1 58 „	646	Rev. P. W. Stow	D.
Bahama Bank Lightship	54 20 „	4 13 „	—	Light-keepers	W.
Ballantrae, Ayrshire	55 6 „	5 0 „	—	Coastguard	W.
Ballydonegan, Co. Cork	51 38 „	10 3 „	—	„	W.
Ballyglass, Co. Mayo	54 17 „	9 52 „	—	„	W.
Baltimore, Co. Cork	51 28 „	9 22 „	—	„	G.
Bantry	51 41 „	9 27 „	—	R. Brennan	R.
Bawtry (Hesley Hall), Notts.	53 26 „	1 2 „	65	B. I. Whitaker	F.
Belmullet, Co. Mayo	54 13 „	9 59 „	40	Miss M. J. Tolan	T.
Belvoir Castle, Grantham	52 54 „	0 47 „	259	W. H. Divers	D.
Ben Nevis	56 48 „	5 0 „	4,406	R. T. Omond, for Directors Ben Nevis Observatory.	A.
✠ Bennington, Herts.	51 54 „	0 5 „	407	Rev. J. D. Parker	R.
✠ Berkhamstead	51 46 „	0 34 „	400	E. Mawley	E.
Bidston Observatory, Liverpool.	53 24 „	3 4 „	188	W. E. Plummer	D. T.
✠ Blackpool	53 48 „	3 3 „	31	A. J. Anderson	F. S
Blacksod Point, Co. Mayo	54 6 „	10 4 „	—	Coastguard	W.
Bolton (Chadwick Museum)	53 35 „	2 27 „	389	W. W. Midgley	G.
Bournemouth	50 43 „	1 53 „	—	Messrs. Primavesi for Town Council.	S.
✠ Braemar	57 0 „	3 24 „	1,111	J. Aitken	D. F. S.
Bramley, Surrey	51 11 „	0 33 „	148	J. Bartlett	D.
Bray, Co. Wicklow	53 12 „	6 6 „	—	Coastguard	G.
Brighton	50 49 „	0 8 „	—	A. Newsholme	S.
Bristol	51 28 „	2 35 „	92	J. Harvey Jones	F.
Broadford (Hurdlestown), Co. Clare.	52 48 „	8 38 „	157	Maj. W. O. Bentley, R.A.	R.
Brookeborough (Colebrooke Park), Co. Fermanagh.	54 21 „	7 22 „	271	M. Ferguson, for Sir A. D. Brooke, Bt.	D. F.
Burnmouth, Ayton, Berwick	55 51 „	2 4 „	—	Coastguard	W.
Burntisland	56 4 „	3 14 „	—	„	W.
✠ Buxton	53 14 „	1 54 „	987	E. J. Sykes	R.
Caernarvon Bay Lightship	53 6 „	4 43 „	—	Light-keepers	W.
Cambridge	52 13 „	0 6 E.	88	Miss A. Walker	T. S.
Cardigan Bay Lightship	52 25 „	5 1 W.	—	Light-keepers	W.
✠ Cargen	55 2 „	3 37 „	72	P. Dudgeon (the late) and A. Peacock.	R.
✠ Carmarthen	51 52 „	4 18 „	188	G. J. Hearder	D.
Carrigallen, Co. Leitrim	53 58 „	7 38 „	? 350	Mrs. J. Godley	R.
Castletownshend, Co. Cork	51 32 „	9 11 „	—	Coastguard	G.
Chatham	51 23 „	0 32 E.	136	The Instructor in Surveying.	G.
✠ Cheadle	52 58 „	1 57 W.	646	J. C. Philips	R. F.
✠ Cheltenham	51 54 „	2 3 „	184	R. Tyrer	E.
Chester	53 12 „	2 54 „	59	Rev. J. Cairns Mitchell.	D.
✠ Churchstoke	52 31 „	3 5 „	538	P. Wright	D. F. S.
Cirencester	51 43 „	1 57 „	446	Prof Ohm	F. S.
Cleggan, Co. Galway	53 53 „	10 8 „	—	Coastguard	W.
Coningbeg Lightship	52 2 „	6 40 „	—	Light-keepers	W.
Cooper's Hill, Egham	51 26 „	0 34 „	279	Prof. H. McLeod	G.
Cromarty	57 41 „	4 0 „	—	Coastguard	W.
Crookhaven	51 28 „	9 43 „	—	„	G.
Crosshaven	51 48 „	8 18 „	—	„	G.
Cuckfield, Sussex	51 1 „	0 9 „	389	John Howe	R.
✠ Cullompton	50 51 „	3 23 „	202	T. Turner	F. S.
Daunt's Rock Lightship	51 43 „	8 16 „	—	Light-keepers	W.
Deerness, Orkney Islands	58 56 „	2 45 „	169	M. Spence	B. D. S.
Donaghadee	54 38 „	5 32 „	26	T. MacGowan	T.
Doneraile, Co. Cork	52 13 „	8 34 „	—	Captain Evans	R.
Douglas (Cronkbourne) Isle of Man.	54 10 „	4 29 „	137	A. W. Moore	D. F. S.
Dublin (Botanic Gardens, Glasnevin).	53 23 „	6 16 „	67	F. W. Moore	D.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
Dublin (City)	53° 20′ N.	6° 15′ W.	47	J. W. Moore	D. F.
Dublin (Mountjoy Observatory, Phœnix Park).	53 22 „	6 21 „	155	Lt.-Col. Kirkwood, R.E.	B. D. S.
⚓ Dundee	56 28 „	2 56 „	160	J. Carnochan	D.
Dunfanaghy (Sheephaven)	55 11 „	7 58 „	—	Coastguard	W.
Dungeness	50 55 „	0 59 E.	26	W. Batton	T.
⚓ Dunrobin Castle	57 59 „	3 56 W.	12	D. Melville, for the Duke of Sutherland.	D.
Durham	54 46 „	1 35 „	336	H. J. Carpenter	D. F. S.
Dursley (Farnley), Glos.	51 41 „	2 21 „	—	R. W. Pinney	R.
Eastbourne	50 46 „	0 17 E.	39	R. Sheward	D. S.
East Goodwin Lightship	51 13 „	1 36 „	—	Light keepers	W.
Edgeworthstown (Currygrane).	53 45 „	7 39 W.	267	J. M. Wilson	D. F.
Edinburgh	55 57 „	3 12 „	253	R. C. Mossman	D. S.
English and Welsh Grounds Lightship.	51 27 „	3 0 „	—	Light-keepers	W.
Ennis, Co. Clare	52 51 „	8 59 „	18	P. L. K. Dobbin	R.
„ (Roslevan)	52 51 „	8 59 „	40	Mrs. J. W. Scott	R.
Epsom (Royal Medical College).	51 20 „	0 14 „	294	C. I. Gardiner	D.
Falmouth	50 9 „	5 4 „	167	E. Kitto	A. F.
Fleetwood	53 56 „	3 1 „	—	M. S. Gaulter	B.
Forgandenny, Perth	56 21 „	3 29 „	175	C. L. Wood	C.
⚓ Fort Augustus	57 8 „	4 40 „	68	Rev. M. Wall	E. F. S.
Fort William	56 48 „	5 6 „	32	R. T. Omond, for Directors, Ben Nevis Observatory.	A. F.
Foynes, Co. Limerick	52 37 „	9 7 „	108	Lord Monteagle	F.
Fulbeck, Lincolnshire	53 3 „	0 37 „	180 ?	Rev. Vere F. Willson	R.
Geldeston, Beccles	52 28 „	1 31 E.	37	E. T. Dowson	D. F. S.
Gilcrux, Maryport	54 44 „	3 23 W.	261	J. Monkhouse	D.
Glasgow	55 53 „	4 18 „	180	Prof. L. Becker	A. D. F.
⚓ Glencarron	57 30 „	5 14 „	489	D. D. Munro	E. F.
⚓ Glenlee	55 5 „	4 12 „	203	W. Melville	E. F.
⚓ Gordon Castle	57 37 „	3 5 „	101	J. Webster (for the Duke of Richmond and Gordon, K.G.).	E.
Gorleston, Suffolk	52 35 „	1 43 E.	—	R. J. C. Day	G.
Guernsey (St. Peter's)	49 32 „	2 32 W.	—	F. E. Carey	S.
Harpenden, Herts.	51 49 „	0 20 „	419	T. Wilson	G.
Haslar Hospital, Hants	50 47 „	1 7 „	—	T. Rogers	G.
Hawes Junction	54 19 „	2 18 „	1135	W. H. Bunce	G.
⚓ Hereford	52 5 „	2 45 „	274	T. A. Chapman	F.
Heysham Hall, Lancashire	54 3 „	2 54 „	95	S. Lomas, for Miss L. Grafton.	D.
⚓ Hillington	52 48 „	0 33 E.	88	Rev. H. E. B. Ffolkes	D. F. S.
Holyhead (Harbour Office)	53 18 „	4 39 W.	57	F. M. Cotton	B. W.
„ (Sailors' Home)	53 18 „	4 39 „	48	T. Chope	T.
Hurst Castle	50 42 „	1 33 „	12	E. T. Tremble	T.
Jersey (St. Aubins)	49 12 „	2 11 „	25	J. Fisher	T.
„ (St. Heliers)	49 11 „	2 6 „	—	Signal Officer, Fort Regent.	S.
Kearsney Abbey, Dover	51 8 „	1 17 E.	100 ?	C. W. Curtis	R.
Ketton, Stamford	52 38 „	0 32 W.	—	F. Coventry	F. G.
„ „ (The Holmes)	52 38 „	0 32 „	—	„	R.
„ „ (Colley Weston)	52 37 „	0 31 „	270	Miss A. Tasker	R.
Kew Observatory	51 28 „	0 19 „	18	C. Chree	A.
Kilcredane, Co. Clare	52 35 „	9 47 „	—	Coastguard	W.
Kilkenny	52 39 „	7 14 „	212	H. Carlton, for the Marquis of Ormonde.	C. F.
⚓ Killarney	52 4 „	9 30 „	86	Ven. Archdeacon Wynne.	E. F.
Killiney (Cloncevin), Co. Dublin.	53 16 „	6 7 „	—	R. O'Brien Furlong	R.
Kirkwall	58 5 „	2 57 „	—	Coastguard	W.
Kish Bank Lightship	53 1 „	5 55 „	—	Light keepers	W.
Ladylaw (Hawick)	55 28 „	2 47 „	439	W. R. Wilson	C. D.
⚓ Lairg	58 1 „	4 22 „	335	J. McLeod	E. F.
Lamlash, Isle of Arran, Scotland.	55 32 „	5 8 „	—	Coastguard	W.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
Landale, Argyleshire	° ′ 56 41 N.	° ′ 5 41 W.	14	A. Fletcher, for T. H. G. Newton.	D. F.
⚓ Lednathie	56 45 „	3 7 „	719	W. Morrison (for Stormonth Darling).	E.
Leith	55 58 „	3 10 „	20	T. Richardson	T.
Leman and Ower Lightship	53 8 „	2 2 E.	—	Light-keepers	W.
Lerwick	60 9 „	1 8 W.	—	Coastguard	W.
⚓ Lissan, Co. Tyrone	54 41 „	6 45 „	305	Sir Nathaniel Staples, Bart.	E.
Llandinam, Montgomery	52 29 „	3 26 „	496	Edward Davies	R.
Llandovery	51 59 „	3 48 „	217	J. Watkins	F.
⚓ Llandudno	53 21 „	3 50 „	88	J. Nicol	E. F.
„	53 21 „	3 51 „	?20	J. McMaster	S.
London (Brixton)	51 29 „	0 7 „	77	F. Gaster	T.
„ (City)	51 32 „	0 5 „	80	Messrs. de la Rue	S.
„ (Pall Mall)	51 32 „	0 8 „	—	Athenæum Club	C.
„ (Stamford Hill)	51 36 „	0 5 „	?75	Rev. J. Seymour St. John.	R.
„ (Westminster)	51 31 „	0 8 „	76	The Staff of the Met. Office.	B. S.
Londonderry	55 0 „	7 19 „	67	J. Conroy	D. F.
Loughborough	52 47 „	1 12 „	169	W. Berridge	T.
Lowestoft	52 29 „	1 44 E.	—	J. Moore	G.
Malin Head, Co. Donegal	55 23 „	7 24 W.	230	O. O'Doherty	T. C.
Manchester	53 29 „	2 13 „	190	J. Tatham	G. S.
⚓ Marchmont	55 44 „	2 25 „	498	J. A. Wood	E. F. S.
⚓ Margate	51 24 „	1 24 E.	83	J. Stokes	D. S.
Market Rasen	53 23 „	0 20 W.	83	W. B. Jevons	R.
Markree Castle, Co. Sligo	54 11 „	8 27 „	122	A. Marth, for Col. Cooper.	D. F. S.
Minard, Co. Kerry	52 7 „	10 8 „	—	Coastguard	W
Mold (Penbedw)	53 12 „	3 11 „	650	H. W. Buddicom	C.
Morpeth	55 11 „	1 40 „	—	Captain H. Terry	G. C.
Mount Nugent (Arley Cottage).	53 50 „	7 18 „	262	Major Somerset H. Maxwell.	D. S.
Nairn	57 36 „	3 52 „	84	Miss Penny	T.
Newcastle-on-Tyne	54 58 „	1 37 „	152	N. H. Martin	G. S.
Newarp Lightship	52 45 „	1 53 E.	—	Light-keepers	W.
Newquay, Cornwall	50 25 „	5 4 W.	?250	J. Pearce	S.
„ „	50 25 „	5 5 „	—	Coastguard	W.
Northallerton	54 20 „	1 26 „	130	W. Stead	R.
North Foreland	51 23 „	1 27 E.	115	A. Cox	T.
North-West Lightship Liverpool.	53 31 „	3 31 W.	—	Light-keepers	W.
⚓ Ochtertyre	56 23 „	3 53 „	329	G. Croucher, for Sir P. K. Murray, Bart.	E. F.
Omagh (Edenfel)	54 36 „	7 19 W.	300	Col. Buchanan	F.
Oswaldkirk, Yorks.	54 12 „	1 3 „	—	R. Thompson	S.
Outer Dowsing Lightship	53 27 „	1 5 E.	—	Light-keepers	W.
Owers Lightship	50 39 „	0 41 W.	—	„	W.
Oxford	51 46 „	1 16 „	208	W. Wickham, for E. J. Stone.	T. S.
Parkstone, Dorset	50 43 „	1 56 „	197	R. H. Barnes	D.
Parsonstown (Birr Castle)	53 6 „	7 55 „	175	O. Boeddicker, for Earl of Rosse.	D. S. T.
Pennant Bay, Aberdour	57 40 „	2 16 „	—	Coastguard	W.
⚓ Pinmore Girvan	55 12 „	4 49 „	187	P. Donald, for Capt. Hamilton.	E.
Plymouth (The Hoe)	50 22 „	4 8 „	116	H. Victor Prigg	D. F. S.
„ (Freedom Fields)	50 24 „	4 8 „	207	„	R.
⚓ Poltalloch	56 8 „	5 30 „	132	J. Russell, for John Malcolm of Poltalloch.	E.
Portrush	55 13 „	6 40 „	—	Coastguard	W.
Prawle Point	50 12 „	3 43 „	332	M. Holmes	T.
Prestwich	53 32 „	2 17 „	294	T. R. H. Clunn	D. F. S.
Roche's Point, Cork	1 47 „	8 19 „	42	W. Kennedy	T.
Rochford, Tenbury	52 18 „	2 36 „	316	John Tomson	R. C.
⚓ Rosewell	55 51 „	3 7 „	690	R. W. D. Cameron	E.
Rothamsted	51 48 „	0 22 „	308	Sir J. B. Lawes and Sir J. H. Gilbert.	F. S.
⚓ Rothesay	55 50 „	5 4 „	115	J. Kay	E.
⚓ Rounton, Yorkshire	54 24 „	1 18 „	249	Sir I. L. Bell, Bart.	E.
⚓ Rousdon, Devon	50 42 „	3 0 „	523	C. E. Peek	E.
Roxborough, Co. Limerick	52 39 „	8 36 „	—	A. W. Shaw	R.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
Royal Sovereign Lightship.	50 43 N.	0 27 E.	—	Light-keepers	W.
Rugby	52 23 „	1 15 W.	379	H. P. Highton	G.
St. Ann's Head, Pembroke	51 41 „	5 11 „	150	H. T. Knott	T. S. W.
St. David's, Pembrokeshire	51 53 „	5 16 „	215	W. P. Propert	D.
St. Helen's, Lancashire	53 28 „	2 45 „	151	J. Robertson	G.
St. Leonards	50 51 „	0 33 E.	129	H. Colburne	D. F. S.
Salcombe, Kingsbridge	50 14 „	3 46 W.	—	Coastguard	W.
Sandgate, Kent	51 4 „	1 9 E.	56	H. E. Stilgoe	R.
Scarborough	54 17 „	0 23 W.	159	H. G. H. Monk	D. F.
„	54 17 „	0 23 „	—	Coastguard	W.
Schull	51 32 „	9 33 „	—	„	G.
Scilly Islands (St. Mary's)	49 56 „	6 18 „	80	A. Hicks	B.S.T.W.C.
Seafield, Miltown Malbay Co. Clare.	52 48 „	9 30 „	—	Coastguard	W.
Seaham Harbour	54 50 „	1 19 „	148	G. H. Aird	D.
Sedbergh	54 19 „	2 32 „	400	A. P. Burra	R.
Seven Stones Lightship	50 4 „	6 5 „	—	Light-keepers	W.
Shambles Lightship	50 31 „	2 20 „	—	„	W.
Sheffield	53 23 „	1 29 „	429	E. Howarth	D.
Shields, North	55 0 „	1 27 „	97	J. W. Irvine	T.
Shields, North, High Lighthouse.	55 0 „	1 27 „	—	Captain Harrison	B.
Shipwash Lightship	52 2 „	1 38 E.	—	Light-keepers	W.
Solihull, Birmingham	52 28 „	1 48 W.	459	B. Boothroyd	G. F.
Solway Lightship	54 48 „	3 32 „	—	Light-keepers	W.
Southampton	50 55 „	1 24 „	78	J. T. Cook, for Dir. Gen. of Ordnance Survey.	D.F.S.
South Rock Lightship	54 25 „	5 22 „	—	Light-keepers	W.
Spidall, Co. Galway	53 15 „	9 17 „	—	Coastguard	G.
Spurn Head	53 34 „	0 7 E.	19	G. Freeman	T.
Spurn Lightship	53 34 „	0 13 „	—	Light-keepers	W.
Stokesay, Craven Arms	52 26 „	2 52 W.	370	Miss M. A. Digges La Touche.	D.
Stonyhurst College	53 51 „	2 28 „	375	Rev. W. Sidgreaves	A.D.F.
Stornoway	58 11 „	6 22 „	28	J. Mackenzie	T.S.C.
„	58 11 „	6 22 „	—	Coastguard	W.
Stowell, Sherborne, Dorset.	50 57 „	2 31 „	376	Rev. H. J. Poole	F.
Stranraer	54 54 „	5 2 „	—	Coastguard	G.
Strathfield Turgiss, Hants	51 20 „	1 0 „	195	Rev. C. H. Griffith	F.
Strathpeffer-Spa, N.B.	57 34 „	4 34 „	253	J. Tregelles Fox	D.
Sumburgh Head (Dunrossness).	59 51 „	1 17 „	126	Rev. W. Brand	T. C.
Sunderland	54 54 „	1 23 „	—	Coastguard	W.
Sutton Coldfield	52 34 „	1 49 „	392	C. F. Marston	S.
Symbister, Shetlands	60 14 „	1 25 „	—	J. S. Nicolson	G.
Tealby, Lincolnshire	53 24 „	0 16 „	251	Rev. S. Lewin	D.
Teelin, Donegal	54 38 „	8 39 „	—	Coastguard	W.
Tenby	51 41 „	4 42 „	79	J. E. Gower	S.
Thurcaston, Leicester	52 42 „	1 10 „	253	Rev. T. A. Preston	S.
Torquay	50 28 „	3 31 „	—	A. Chandler	S.
Totland Bay, Isle of Wight	50 41 „	1 33 „	84	J. Dover	G.
Union Hall, Co. Cork	51 33 „	9 8 „	—	Coastguard	G.
Uppingham	52 35 „	0 44 „	484	Rev. G. H. Mullins	D.
Uzon (Montrose)	56 40 „	2 28 „	—	Coastguard	W.
Valencia Observatory, Cahirciveen.	51 56 „	10 15 „	30	J. E. Cullum	A. T.C.
„ Island (Glanleam)	51 56 „	10 20 „	—	Miss E. FitzGerald	R.
„ (Knightstown)	51 55 „	10 20 „	—	Coastguard	G.
Wakefield	53 41 „	1 30 „	96	H. Clarke	E.
Waterford (Brook Lodge)	52 14 „	7 6 „	104	C. P. Bolton	F.
Waterford	52 16 „	7 7 „	—	Harbour Authorities	C.
Westbourne, Sussex	50 52 „	0 55 „	—	Rev. L. B. Birkett	S.
Westray, Orkney	59 17 „	3 0 „	—	J. Hewison	G.
Wick	58 27 „	3 6 „	80	J. Sinclair	T.
„	58 27 „	3 6 „	—	Coastguard	W.
Wolfelee	55 23 „	2 39 „	587	W. Cockburn	D.
Worksop	53 18 „	1 8 „	—	H. Mellish	S.
Yarmouth	52 37 „	1 43 E.	10	G. T. Watson	B.T.C.
Ynis-y-bro, Newport	51 38 „	3 3 W.	115	F. W. Houghton	R.
York (Boothgate)	53 57 „	1 5 „	—	J. E. Clark	S.
„ (The Museum)	53 57 „	1 5 „	51	H. M. Platnauer	D. T.

In addition to those already mentioned, reports are received daily from the following Continental Stations.

Station.	Authority.	Station.	Authority.
Haparanda	Meteorological Office, Stockholm.	†The Helder	Bureau Central Météorologique, Paris.
Herndsand		Cape Gris Nez	
†Stockholm		†Brest (St. Mathieu)	
Wisby		Lorient (Ile de Groix)	
Karlstad		*†Rochefort (Ile d' Aix)	
Bodö	Meteorological Institute, Christiania.	†Biarritz	
†Christiansund		†Paris	
*†Skudesnaes		Belfort	
Færder		Lyons	
		Nice	
		Perpignan	
†The Scaw	Meteorological Institute, Copenhagen.	Berlin	Cent. Met. Inst. of Germany.
Fanö		Wiesbaden	
		Munich	
Cuxhaven	Deutsche Seewarte, Hamburg.	Corunna	Observatory, Lisbon.
		†Lisbon	
		Azores (P. Delgada)	

Note.—The stations marked with an asterisk (*) report also at 2h. p.m., and those with a dagger (†) at 6h. p.m.; Lisbon reports at 4h. p.m. instead of 6h. p.m.
The Helder does not send reports at 6 p.m. on Sundays.

APPENDIX XII.

LIST of DOCUMENTS received from FOREIGN LAND STATIONS during the year ending 31st March 1895.

Place.	Observer.	Nature of Observations.
Abaco (Bahamas)	T. R. Thompson, Sen., Lightkeeper	Lighthouse Register, 1894, January to December.
Antigua	Francis Watts	Two observations daily, 1894, March to December; 1895, January, February.
Beyrout (Lee Observatory)	R. H. West, M.A.	Two observations daily, 1894, March to December; 1895, January, February.
Breaksea Island (King George's Sound).	J. A. Symonds	Lighthouse Register, 1894, January to June.
British Guiana, "Encore" Mine	G. G. Dixon	Daily observations, 1893, January to December; 1894, January to March.
Cape Juby (N.W. Africa)	F. S. Zaytoun, O. Kloster and L. C. Carter.	Two observations daily, 1894, February to December; 1895, January, February.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper	Lighthouse Register, 1894, January to December.
Cape Spartel (Tangier)	E. C. Hathaway, Lloyd's Signalman.	Two observations daily, 1894, March to December; 1895, January, February.
Cay Lobos (Bahamas)	Lightkeeper	Lighthouse Register, 1894, January to December.
Cay Sal (Bahamas)	J. A. Williams, Lightkeeper	„ „ „ „ June.
Famagusta (Cyprus)	G. Eliades	Two observations daily, 1893, June to December; 1894, January to December.
George Town (British Guiana)	Robert Ward	Two observations daily, 1894, January to December; 1895, January.
„ „ „ „	„ „	Daily record of sunshine, 1894, February to December; 1895, January.
Gibraltar	Staff-Sergeant R. Scott, and Sergeant A. W. Harwood, Med. Staff Corps.	Two observations daily 1894, March to December; 1895, January, February.
Hawaii, Pauilo, Hamakua	Rev. Eric Lewis	Two observations daily, 1894, February, May, and June.
Inagua (Bahamas)	Lightkeeper	Lighthouse Register, 1894, January to December.
Kyrenia (Cyprus)	P. Michaelides	Two observations daily, 1893, June to December; 1894, January to December.
Lagos	Wm. A. Cole and J. Julius Apena	„ „ „ 1894, February to December; 1895, January.

Suva (Fiji) - - -	J. D. W. Vaughan, F.R.Met. Soc., F.R.G.S.	One observation daily, 1893, November, December; 1894, January to July, September to December.
Teneriffe (Sitio de Cullen) -	A. F. Perry - - -	Two observations daily, 1894, March to December; 1895, January.
„ „ „ - -	„ - - -	Continuous record of pressure and temperature, 1894, March to December; 1895, January.
Tonga (New Hebrides) - -	A. Cronstedt - - -	Two observations daily, 1894, January to December.
Trinidad - - - -	J. H. Hart, Supt. Botanic Gardens -	„ „ „ 1894, January to December; 1895, January.
Watling Island (Bahamas) -	T. R. Thompson, jun., Lightkeeper -	Lighthouse Register, 1893, July to December; 1894, January to December.
Zomba, British Central Africa -	John McClounie - -	Two observations daily, 1894, September to December.

APPENDIX XIII.

ACCESSIONS TO THE LIBRARY DURING THE YEAR ENDING 31ST MARCH 1895.

* **Abney, [W. de W.] and Festing, [E. R.]**—The influence of water in the atmosphere on the solar spectrum and solar temperature. 8°. (*Proc. R. Soc.*, XXXV., 1893, *p.* 328.)

* **Aeronautics.**—Published by the American Engineer and Railroad Journal. Vol. i., 1893–94. la. 4°. New York, 1893–94.

Aitken, James.—Meteorological table for the years 1887–89, 1891–94. Compiled from observations taken at Braemar, Aberdeenshire. Oblong sm. f°. Sheets.

‖ ——— **John.**—On the number of dust particles in the atmosphere of certain places in Great Britain and on the Continent, with remarks on the relation between the amount of dust and meteorological phenomena. Part iii. la. 4°. Edinburgh, 1894. (*Trans. R. Soc. Edinb.*, XXXVII., *Part* iii., *p.* 621.)

[Algiers, Service Météorologique du Gouvernement Général de l'Algérie.]—Bulletin météorologique de l'Algérie. 1894, Jan. 1–Dec. 31. sm. f°. Sheets.

[Allahabad, Meteorological Office.]—Brief sketch of the meteorology of the North-Western Provinces and Oudh and adjacent parts of Rajputana and the Panjab for the years 1886, 1890, 1893. 3 vols., sm. f°. s.l.e.a.

American Meteorological Journal.—A monthly review of meteorology. Vol. x., 1893–94. la. 8°. Boston, s.a.

* **Amontons, [G.]**—Discours sur quelques propriétés de l'air, et le moyen d'en connoître la température dans tous les climats de la terre. 4°. (*Mém. Acad. R. Sc., Paris*, 1702, *p.* 155.)

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.—Tijdschrift. Tweede serie. Deel xi. 2 vols. 8°. Leiden, 1894.

Angot, A.—Les aurores polaires. 8°. Paris, 1895.

Arcimis, A.—La circulación atmosférica. sm. 8°. Madrid, 1895.

* **Atmometer.**—[Encycl. Brit., ? date, *p.* 131.]

Azambuja, G. A. de.—Annuario do Estado do Rio Grande do Sul. 1894, 1895. Annos, x., xi. 2 vols., sm. 8°. Porto Alegre, 1893–94.

Baltimore, Maryland State Weather Service.—The climatology and physical features of Maryland. First biennial report of the Maryland State Weather Service for the years 1892 and 1893. la. 8°. Baltimore, 1894.

——— ——— Monthly summary, 1891, May to Nov. (except Oct.). la. 8°. s.l.e.a.

——— ——— Monthly report. Vols. ii., iii., 1892–94. 4°. s.l.e.a.

Bangalore, Mysore Government Meteorological Department.—Report on rainfall registration in Mysore for 1893, by J. Cook. la. 4°. Bangalore, 1894.

* **Barnard, C.**—Talks about the weather in its relation to plants and animals. sm. 8°. New York, 1894.

‖ **Barnes, R. H.**—Some remarks on [the weather of] 1893. f°. Sheet. (*Parkstone Reminder, Feb. 17th*, 1894.)

* **Barois, J.**—Notice sur le climat du Caire. la. 8°. *pp.* 78–212. [? Where from.]

Bartoli, A.—Influenza del pulviscolo atmosferico sulla trasmissibilità delle radiazioni solari. la. 8°. (*Riv. Scient. Industr., Firenze*, XXVI., 1894, *p.* 141.)

NOTE.—Books marked * have been acquired by purchase; the others are donations from institutions, societies, or authors. Those marked ‖ are excerpt papers, extra copies of which have been separately printed.

In some cases additional publications have been received besides those specified, but only completed volumes or years are given here.

Batavia, Magnetical and Meteorological Observatory.—Observations. Vol. xvi., 1893. f°. Batavia, 1894.

[——— **Observatorium.**]—Regenwaarnemingen in Nederlandsch-Indië. xv. Jaarg. 1893. 8°. Batavia, 1894.

Title and Preface in the English language also.

‖ **Batchelder, S. F.**—A new series of isanomalous temperature charts, based on Buchan's isothermal charts. 8°. (*Amer. Meteor. Journ.*, 1894, *Mch.*, *p.* 451.)

Bathurst, Gambia.—Comparative rainfall, Colony of the Gambia, 1889–93, and meteorological observations, 1893. sm. f°. Sheet.

——— Meteorological observations. 1894. sm. f°. Sheet.

Bauer, L.—Beiträge zur Kenntniss des Wesens der Säcular-Variation des Erdmagnetismus. sm. f°. Berlin, 1895.

Baxendell, J.—Abstracts of observations at the Southport meteorological observatory for the weeks ending Jan. 5, 1894 to Jan. 4, 1895. Slips.

‖ **Bebber, W. J. van.**—Häufigkeit und Tiefe der barometrischen Minima sowie Bahnen der Maxima und stationäre Maxima in dem Zeitraum vom Winter 1883-84 bis Ende Herbst 1887. la 8°. (*Ann. Hydr. mar. Meteor.*, 1894, *Juni.*)

Belize.—Summary of meteorological observations at St. Joseph's Observatory during the months of Jan.–Dec. 1894. 4°. Sheets. (*The Angelus, Belize*, 1894–95.)

Berlin, Deutsche Meteorologische Gesellschaft.—Berliner Zweigverein der deutschen meteorologischen Gesellschaft. 12. Vereinsjahr, 1895. 8°. Berlin, 1895.

——— **Königlich Preussisches Meteorologisches Institut.**—Bericht über die Thätigkeit . . . im Jahre 1893 von W. von Bezold. la. 8°. Berlin, 1894.

——— ——— Ergebnisse der magnetischen Beobachtungen in Potsdam in den Jahren 1890 und 1891. la. 4°. Berlin, 1894.

——— ——— Ergebnisse der Niederschlags-Beobachtungen im Jahre 1892. la. 4°. Berlin, 1894.

‖ ——— ——— Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1894, Jan.–Dec. la. 4°. (*Statist. Korresp.*)

* **Bertelli, P. T.**—Appunti storici intorno all' antica "Rosa nautica" italiana. la. 8°. (*Riv. Marittima, Roma*, xxvi., 1893, *p.* 221.)

‖ **Bezold, W. v.**—Ueber Wolkenbildung. Vortrag, gehalten in der Urania am 29 Nov. 1893. Sammlung populärer Schr.ften herausgegeben von der Gesellsch. Urania zu Berlin. la. 8°. Berlin, 1894. (*Himmel und Erde*, vi., *Heft* 5.)

Bibliothèque Universelle [et Revue Suisse]. Archives des sciences physiques et naturelles. Troisième période. Tomes xxxi.–xxxii. 2 vols. 8°. Genève, 1894.

* **Blagden, C.**—History of the congelation of quicksilver. 4°. (*Phil. Trans. abridged by Hutton, &c.*, xv., 1809, *p.* 431.)

Bombay, Government Observatory.—Magnetical and meteorological observations made at the Government Observatory, Bombay, in the year 1893, under the direction of C. Chambers and C. Chambers, jun. f°. Bombay, 1894.

(——— ———) Report on the condition and proceedings of the Government Observatory, Colába, for the year which ended with the 30th June 1894. f°. s.l.e.a.

[Bombay, Meteorological Office.]—Brief sketch of the meteorology of the Bombay Presidency in 1893–94. f°. s.l.e.a.

* **Booth, W. B.**—Journal of meteorological observations, made in the garden of the Horticultural Society at Chiswick, during the years 1826–29. 4 parts. 4°. (*Trans. Hortic. Soc.*, vii., 1827–28, *pp.* 102, 346; i., 2*nd. ser.*, *pp.* 111, 171.)

For 1825, see LONDON, R. HORTIC. SOC.
For continuation, see BOOTH, W. B., AND THOMPSON, R.

* **Booth, W. B., and Thompson, R.**—Journal of meteorological observations made in the garden of the Horticultural Society at Chiswick, during the year 1830. 4°. (*Trans. Hortic. Soc.*, i., 2*nd. ser.*, *p.* 297.)

For previous years, see BOOTH, W. B.
For continuation, see THOMPSON, R.

|| **[Boston, Mass., Weather Bureau.]**—Annual summary of the New England Weather Service for the year 1893. la. 4°. Cambridge, Mass., 1894. (*Ann. Astr. Obs. Harvard Coll.*, xli., *No.* 2, *p.* 33.)

——— ——— Bulletin of the New England Weather Service. 1894, Jan.–Dec. 4°. s.l.e.a.

Bremen, Meteorologische Station I. Ordnung. — Deutsches meteorologisches Jahrbuch für 1893. Ergebnisse der meteorologischen Beobachtungen. Herausgegeben von Dr. P. Bergholz. Jahrg. iv. la. 4°. Bremen, 1894.

Brisbane, Post and Telegraph Department, Meteorological Branch.—Table of rainfall. 1891, 1892. Jan.–Dec. f°. Sheets.

British Honduras.—Annual report for 1893. Colonial reports (annual), No. 116. la. 8°. London, 1894.

British New Guinea.—Annual report on British New Guinea, from 1st July 1891 to 30th June 1892; with appendices. sm. f°. Brisbane, 1893.

——— Meteorological observations taken at Port Moresby. July 1892 to Dec. 1893. f°. sheets. (*Suppl. to British New Guinea Gov. Gaz.*, vols. vi.–vii., 1893–94.)

British North Borneo Herald and Official Gazette. Vol. xii. 1894. Nos. 1–12. f°. Sandakan, 1894.

Contains occasional meteorological observations.

* **Brooke, C.**—On the automatic registration of magnetometers, and meteorological instruments, by photography. No. iii. Read June 21, 1849. la. 4°. (*Phil. Trans.*, 1850, *p.* 83.)

Broounof, P.—Orages dans le bassin du Dniéper en 1893. Travaux du réseau météorologique du bassin du Dniéper. Tome i., N° 9. la. 8°. [Kieff], 1893.

Text in the Russian language.

Brussels, Observatoire Royal.—Bulletin météorologique. 1894, Jan. 1–Dec. 31. f°. Sheets.

Buchan, A.—Report on oceanic circulation.

See Edinburgh, Challenger Office.

|| **Buchanan, J.-Y.**—Sur la densité et l'alcalinité des eaux de l'Atlantique et de la Méditerranée. 4°. (*Compt. rend.*, cxvi., 1893, *p.* 1321.)

Bucharest, Institutul Meteorologic al Romaniei.—Analele . . . de S. C. Hepites. Tom. viii., 1892. la. 4°. Bucuresti, 1894.

In the French language also.

——— ——— Buletinul observatiunilor meteorologice din Romania publicat de S. C. Hepites. Anii ii.–iii., 1893–94. 2 vols. sm. f°. Bucuresti, 1893, 1895.

|| ——— ——— Resumat al observatiunilor meteorologice făcute la Bucuresti (Filaret) în anii 1891 şi 1892 şi în perióda de la 1885 la 1890. la. 4°. Bucuresti, 1894. (*Anal. Inst. Meteor. Roman.*, viii., 1892, *p. C* 317.)

In the French language also.

——— ——— Al seaptelea raport asupra lucrărilor Institutului Meteorologic în anul 1893. Part i. la. 4°. (*Anal. Inst. Meteor. Roman.*, viii., 1892.)

Buenos Ayres, Oficina Meteorológica Argentina.—Anales. Tomo ix. Parts 1–2. la. 4°. Buenos Aires, 1893–94.

Cairo, Ministère de l'Intérieur. Administration des Services Sanitaires et d'Hygiène Publique.—Bulletin hebdomadaire. 9me année 1894, Nos. 1–52. Suppl. au Journ. Officiel, 1894–95. la. 4°.

[Calcutta, Meteorological Office, Bengal.]—Bay of Bengal weather chart 1894, Jan. 1–Dec. 31. sm. f°. Sheets.

——— ——— Bengal daily weather report. 1894. sm. f°. Sheets.

These reports are only published during the rainy season.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the weeks ending January 6 to December 29, 1894. f°. Sheets.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the months of January to December 1894, with annual tables. sm. f°. Sheets.

——— ——— Meteorological summary for the monsoon period of 1894. sm. f°. s.l.e.a.

[——— ———] Summary of the meteorology of Bengal for the year 1893. sm. f°. s.l.e.a.

Calcutta, Meteorological Office, India.—Abstract of the results of the barometric and thermometric observations taken at the Meteorological Office, Chowringhee. 1894, Jan.–Dec. sm. f°. Sheets.

——— ——— Abstract of the results of the meteorological observations taken at the Alipore Observatory in the months of Jan.–Dec. 1894. sm. f°. Sheets.

——— ——— India daily weather report. 1894. Jan. 1–Dec. 31. f°. Sheets.

[——— ———] Instructions to observers of the India Meteorological Department. By J. Eliot. la. 8°. Calcutta, 1894.

[——— ———] Memorandum on the snowfall in the mountain districts bordering Northern India, and the abnormal features of the weather in India during the past five months, with a forecast of the probable character of the south-west monsoon rains of 1894. f°. (Simla, 1894.)

[——— ———] Meteorological observations recorded at seven stations in India in the year 1893, corrected and reduced. f°. Calcutta, 1894.

(——— ———) Rainfall of India. Third year. 1893. sm. f°. Calcutta 1894.

(——— ———) Report on the administration of the Meteorological Department of the Government of India in 1893–94. f°. s.l.e.a.

——— ——— Results of the barometrical and thermometrical observations taken at the Meteorological Office, Chowringhee, from 31st December 1893 to 29th December 1894. sm. f°. Sheets.

——— ——— Results of the meteorological observations taken at the Alipore Observatory, from 31st December 1893 to 29th December 1894. sm. f°. Sheets.

[——— ———] Tables for the reduction of meteorological observations in India: to accompany the "Hand-book of Instructions to Meteorological Observers." By H. F. Blanford. 2nd ed. la 8°. Calcutta, 1889.

[——— ———] Weather chart of the Indian monsoon area. 1893. Jan. 1–Dec. 31. f°. Sheets.

Cambridge (Mass.), Astronomical Observatory of Harvard College.—Annals. Vol. xl., Part iii. Observations made at the Blue Hill Meteorological Observatory, Mass., U.S.A., in the year 1893. Under the direction of A. L. Rotch. a. 4°. Cambridge, 1894.

Carlsruhe, Centralbureau für Meteorologie und Hydrographie.—Deutsches meteorologisches Jahrbuch für 1893. Grossherzogthum Baden. Die Ergebnisse der meteorologischen Beobachtungen im Jahre 1893. Bearbeitet von C. Schultheiss. Zugleich ii. Theil des Jahresb. . . . . für 1893. la. 4°. Karlsruhe, 1894.

——— ——— Jahresbericht . . . mit den Ergebnissen der meteorologischen Beobachtungen und der Wasserstandsaufzeichnungen am Rhein und an seinen grossern Nebenflüssen 1887–1891 and 1893. 6 vols. la. 4°. Karlsruhe, 1888–1892, 1894.

——— ——— Niederschlagsbeobachtungen der meteorologischen Stationen im Grossherzogthum Baden. 1889, 1–2 Halb. 1893, 1–2 Halb. 1894, 1 Halb. 5 vols. la. 4°. Karlsruhe, 1892, 1894.

——— ——— Uebersicht der Ergebnisse der an den badischen meteorologischen Stationen angestellten Beobachtungen, nebst Wasserstandsaufzeichnungen an den wichtigsten Hauptpegeln des Rheins. 1894. Jan.–Dez. f°. Sheets.

* **Carpenter, W. B.**—Report on scientific researches carried on during the months of August, September, and October, 1871, in H.M. Surveying-ship "Shearwater." 8°. London, 1872. (*Proc. R. Soc.*, xx., *No.* 138, 1872, *p.* 535.)

* **Cassini, [J.]**—Observations météorologiques faites à Aix par M. de Montvalon, Conseiller au Parlement d'Aix, comparées avec celles qui ont été faites à Paris en 1730. 4°. (*Mém. Acad. R. Sc., Paris*, 1731, *p.* 1.)

* ——— Réflexions sur la hauteur du baromètre observée sur diverses montagnes. 4°. (*Mém. Acad. R. Sc., Paris*, 1733, *p.* 40.)

* ——— Réflexions sur les règles de la condensation de l'air. 4°. (*Mém. Acad. R. Sc., Paris*, 1705, *p.* 61.)

* **Cavendish, H.**—An account of the meteorological instruments used at the Royal Society's House. 4°. (*Phil. Trans., abridged by Hutton, &c.*, xiv., 1809. *p.* 49.)

* ——— Observations on Mr. Hutchins's experiments for determining the degree of cold at which quicksilver freezes. 4°. (*Phil. Trans., abridged by Hutton, &c.* xv., 1809, *p.* 420.)

* **Chambers, C.**—Sunspots and terrestrial phenomena:—I. On the variations of the daily range of atmospheric temperature, as recorded at the Colaba Observatory, Bombay. II. On the variations of the daily range of the magnetic declination, as recorded at Colaba Observatory, Bombay. 2 papers, 8°. (*Proc. R. Soc.*, xxxiv., 1882, *pp.* 231 *and* 247.)

Chandler, A.—Abstract of meteorological observations made at Torquay during the year 1894. oblong 1a. 8°. Sheet.

* **Chappell, Edward.**—Narrative of a voyage to Hudson's Bay in His Majesty's ship "Rosamond," containing some account of the North-eastern coast of America and of the tribes inhabiting that remote region. 8°. London, 1817.

Chemnitz, K. Sächsisches meteorologisches Institut. — Deutsches meteorologisches Jahrbuch für 1893. Beobachtungssystem des Königreiches Sachsen. Jahrbuch des Königlich sächsischen meteorologischen Institutes. 1893. Jahrg. xi. der neuen Reihe. 1a. 4°. Chemnitz, 1894.

[——— ———] Wetterbericht. 1894, Jan.–Dec. 1a. 4°. (*Wissensch. Beil. der Leipziger Zeitung*, 1894–95.)

Chicago.—Report of the International Meteorological Congress held at Chicago, Aug. 21–24, 1893.

See WASHINGTON, DEPARTMENT OF AGRICULTURE, WEATHER BUREAU. Bulletin No. 11.

|| **Chree, C.**—Note on the relation between the co-efficients of pressure in thermometry. 8°. (*Phil. Mag.*, 1894, *Oct.*, *p.* 371.)

Christiania, Norsk Meteorologisk Institut.—Oversigt over Luftens Temperatur og Nedbøren i Norge i Aaret 1893. 8°. s.l.e.a.

——— **Norwegisches Meteorologisches Institut.**—Jahrbuch, . . . für 1892. Herausgegeben von H. Mohn. sm. f°. Christiania, 1894.

* **Ciel et Terre.**—Revue populaire d'astronomie, de météorologie, et de physique du globe. xv^e^ année; 1894–95. 8°. Bruxelles, s.a.

Clements, H.—Forecasts for 1895. 7 sheets. sm. 4° and oblong sm. 8°.

Cocos-Keeling Islands.—Report of Mr. Hugh Clifford, Acting British Resident of Pahang, deputed . . . to visit the Cocos-Keeling Islands, 1894. f°. Dated, Pahang, 1894.

Coimbra, Observatorio [Meteorologico e Magnetico da Universidade.]—Observações meteorologicas e magneticas. 1893. f°. Coimbra, 1894.

Collinson, John.—Rainmaking and sunshine. sm. 8°. London, 1894.

|| **Colombo, Surveyor General's Office.**—Report on the meteorology of Ceylon for 1893. sm. f°. (*Ceylon Administr. Rep.*, 1893, *Part* ii., *p.* B 1.)

|| ——— ——— Results of meteorological observations in Ceylon during the months of January to December 1893. f°. Sheets. (*Suppl. Ceylon Gov. Gazette*, 1893–94.)

Constantinople, Observatoire Impérial Météorologique.—Bulletin météorologique. 1889, Mars–Décembre; 1891, 1892; 1893, Fev.–Déc.; 1894. sm. f°. Sheets.

Copenhagen, Dansk Meteorologisk Institut.—Bulletin météorologique du Nord, publié par les Instituts météorologiques de Norvége, de Danemark et de Suède. Année 1894. oblong 8°. Copenhague, s.a.

——— ——— Maanedsoversigt over Vejrforholdene. 1894, Jan.–Dec. f°.

——— ——— Meteorologisk Aarbog for 1891. f°. Kjøbenhavn, 1892.

In the French language also.

——— **Kongelige Danske Videnskabernes Selskab.**—Oversigt over det . . . . Forhandlinger og dets Medlemmers Arbejder i Aaret 1893. 1a. 8°. Kjøbenhavn, 1893–94.

* ——— **und Hamburg, Dänisches Meteorologisches Institut und Deutsche Seewarte.**—Tägliche synoptische Wetterkarten für den nordatlantischen Ozean und die anliegenden Theile der Kontinente. ix. Jahrg., 1–4 Quart., Dez. 1889–Nov. 1890. 4 vols. f°. Copenhague et Hambourg, 1894.

In the French language also.

Cordoba, Academia Nacional de Ciencias.—Boletin. Tom. xii.–xiii. 2 vols. 1a. 8°. Buenos Aires, 1890–92.

|| **Cracow, C. K. Akademii Umiejętnósci w Krakowie.**—Materyaly do klimatografii Galicyi zebrane przez sekcyę meteorologiczną komisyi fizyograficznej . . . 1893. la. 8°. Kraków, 1894. (*Odbitek ze Sprawozd. Kom. fizyogr.*)

——— **K. K. Sternwarte.**—Meteorologische Beobachtungen. 1894. la. 8°. Krakau, 1894.

Croydon Microscopical and Natural History Club.—[Daily rainfall at stations in Kent and Surrey.] 1894. Jan.–Dec. 4°. Sheets.

|| ——— ——— Report of the Meteorological Sub-Committee for 1893. 8°. [*Proc. and Trans. Croydon Microsc. Nat. Hist. Club*, 1894, *p.* 90.]

|| **Curtis, R. H.**—Some characteristic features of gales and strong winds. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xx., 1894, *p.* 262.)

|| **Cyprus.**—Meteorological observations. 1893. sm. f°. [*Cyprus Blue Book.*]

Davos.—Davoser Wetterkarte. Nach dem Schema von Herrn C. Wetzel, Ingenieur, herausgegeben im Auftrag des Curvereins Davos-Platz vom amtl. Beobachter der Schweiz. meteor. Station Davos. 1894. Jan.–Dec. la. f°. Sheets.

In the French and English languages also.

[Dehra Dun, Surveyor General of India.]—General report on the operations of the Survey of India Department . . . during 1892–93. sm. f°. Calcutta, 1894.

|| **Denza, F.**—Aurore boreali viste nel 1893. la. 4°. (*Atti. Accad. Pontif. Nuovi Lincei.*, xlvii., 1894.)

——— Cenni necrologici. la. 8°. (Roma, 1894.)

|| ——— I freddi del gennaio, 1893. la. 4°. Roma, 1893. (*Atti. Accad. Pontif. Nuovi Lincei*, xlvi., 1893.)

|| ——— I grandi calori d'Agosto nel 1893. la. 4°. (*Atti. Accad. Pontif. Nuovi Lincei*, xlvii., 1893.)

|| ——— La siccità nella primavera del 1893. la. 4°. Roma, 1893. (*Atti. Accad. Pontif. Nuovi Lincei*, xlvi., 1893.)

Dewar, D.—Atmospheric tendencies, mean velocity and probable weather. 1895. sm. 4°. Dalkeith, s.a.

* **Dickinson, J.**—Egypt and Nubia: their climate, character, and merits as a winter residence for invalids. 8°. [? *Proc. Liverpool Lit. Phil. Soc.*, 1858, *p.* 195.]

|| **Dickson, H. N.**—Report on physical investigations carried out on board H.M.S. "Jackal," 1893–94. la. 8°. (*Annual Rep. Fishery Board, Scotland*, 12*th*, *p.* 336.)

|| **Dines, W. H.**—Anemometer comparisons. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xviii., 1892, *p.* 165.)

Dorpat, Kaiserliche, livländische gemeinnutzige und ökonomische Sozietät.—Bericht über die Ergebnisse der Beobachtungen an den Regenstationen. 1892, 1893. 2 vols. la. 4°. Dorpat, 1893–94.

Dublin, General Register Office.—Quarterly returns of the marriages, births, and deaths registered in . . . Ireland; . . . 1894. 1st-4th quarters, Nos. 121–124. la. 8°. Dublin, 1894–95.

——— ——— Weekly returns of births and deaths in Dublin (including its suburban districts), and in fifteen of the principal urban sanitary districts in Ireland, 1894. la. 8°. Dublin, 1895.

——— **Royal Dublin Society.**—Scientific proceedings. New series. Vol. vii. 8°. Dublin, 1891–92.

——— Scientific transactions. Series ii. Vol. iv. la. 4°. Dublin, 1888–92.

|| **Dufour, C.**—La scintillation des étoiles. 4°. Lausanne, 1892. (*Extrait du Recueil inaugural Univ. Lausanne.*)

Dunwoody, H. H. C.—Summary of International Meteor. Obsns.
See Washington, Department of Agriculture, Weather Bureau.

Durand-Gréville, [E.].—Les grains et les orages. 4°. [*Compt. rend. acad. sc., Paris*, cxviii., 1894, *p.* 829.]

|| ——— Les grains et les orages la. 4°. (*Ann. Bureau Centr. Météor. Fr.*, 1892, *Mém.*, *p. B.* 249.)

Durban, Natal Observatory.—Report of the superintendent. 1884–1889, 1890–91, 1893–94. 10 vols. Sm. f°. Pietermaritzburg, 1885–1894.

Eastbourne.—Annual report of meteorological observations for the year 1894. (By R. Sheward.) la. 8°. Eastbourne, s.a.

[Eberswalde, Hauptstation des forstlichen Versuchswesen in Preussen.]—Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von A. Müttrich. xx. Jahrg. 1894, Jan.-Dec. 8°. Berlin, 1894.

[——— ———] Jahresbericht über die Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreichs Preussen, des Herzogthums Braunschweig, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von Dr. A. Müttrich. xix. Jahrg., 1893. 8°. Berlin, 1894.

Edinburgh, Challenger Office.—Report on the scientific results of the voyage of H.M.S. "Challenger" during the years 1872–76. A summary of the scientific results. Appendix. (Physics and Chemistry, Part viii.) Report on oceanic circulation. (By A. Buchan.) la. 4°. London, 1895.

Emden, Naturforschende Gesellschaft.—Jahresbericht. 78. 1892–93. 8°. Emden, 1894.

‖ **Falmouth Observatory.**—Meteorological and magnetical tables and reports for the year 1893, with notes by W. L. Fox. 8°. Falmouth, 1894. (*Ann. Rep. R. Cornw. Polyt. Soc.*, 1893.)

——— **Royal Cornwall Polytechnic Society.**—Annual report. 61st. 1893. 8°. Falmouth, s.a.

Faura, F. y Algué, J.—La meteorologia en la Exposición Colombina de Chicago, 1893.

See Manila, Observatorio Meteorológico.

‖ **Fergusson, S. P.**—The pole star recorder. 8°. [*Amer. Meteor Journ.*, xi., 1894, *p.* 62.]

Figee, S.—Uitkomsten van meteorologische waarnemingen in Nederlandsch-Indië, 1891, Juli-Dec., 1892. 2 parts. la. 8°. (*Natuurk. Tijdschr. Nederl.-Ind.*, liii., *pp.* 73 *and* 219.)

Findlay, A. G.—A directory for the North Atlantic Ocean, comprising instructions, general and particular, for its navigation. By A. G. Findlay. 15th edition. Revised and edited by W. R. Kettle. la. 8°. London, 1895 [1894].

Fiume; K. K. Marine-Akademie.—Meteorologische Beobachtungen. 1894. Jan.-Dec., and Results. la. 8°. Sheets.

* **Flagg, A. T.**—Primer of navigation. sm. 8°. London, 1894.

Frankfurt am Main, Physikalischer Verein.—Jahresbericht . . . für das Rechnungsjahr 1892–93. 8°. Frankfurt am Main, 1894.

* **Freminville, Chevalier de la Poix de.**—Voyage to the North Pole, in the Frigate "The Syrene"; including a physical and geographical notice relative to the island of Iceland. 8°. London, 1819. (*Voyages and Travels*, ii., *No.* 2, *p.* 81.)

Garrigou-Lagrange, P.—Relations nouvelles entre les mouvements barométriques sur l'hémisphère nord et les mouvements en déclinaison du soleil et de la lune. 4°. (*Compt. rend.*, cxx., 1895, *p.* 342.)

——— Relations nouvelles entre les mouvements barométriques sur l'hémisphère nord et les mouvements en déclinaison du soleil et de la lune. Communication faite à la soc. météor. de Fr., 5 Fév. 1895. sm. f°. Dated, Limoges, 1895.

Geneva, Société de Géographie.—Le Globe. Journal géographique. Tome xxxiii. la. 8° Genève, 1894.

* **Glaisher, J.**—On the strength or pressure of the wind at Sarona, recorded daily by Herr Dreher in the ten years, 1880 to 1889. 2 papers. 8°. (*Quart. Statement, Palestine Explor. Fund*, 1893, *Jan.*, *p.* 43, *Apl.*, *p.* 143.)

*——— Meteorological report from Jerusalem, 1882–1884. 3 papers. 8°. (*Quart. Statement, Palestine Explor. Fund*, 1893, *July*, *p.* 242; 1893, *Oct.*, *p.* 331; 1894, *Jan.*, *p.* 44.)

* **Glaisher, J.**—On the fall of rain at Jerusalem in the 32 years from 1861 to 1892. 8°. (*Quart. Statement, Palestine Explor. Fund*, 1894, *Jan.*, *p.* 39.)

Glyde, E. E.—Meteorological observations [at Tavistock] for 1894. slip.

Greenwich, Royal Observatory.—Report of the Astronomer Royal to the Board of Visitors, . . . read . . . 1894, June 2. la. 4°. s.l.e.a.

——— ——— Results of the magnetical and meteorological observations made at the Royal Observatory, Greenwich, in the year 1891; under the direction of W. H. M. Christie. la. 4°. London, 1893.

Greenwood, W. N.—Greenwood's nautical almanac, general and coasting kludonometric tide tables . . . . 1895. sm. 4°. Lancaster, s.a.

Grenada, Richmond Hill Observatory.—Meteorological report. By J. M. Lash. 1894, Jan.–Dec. sm. f°. Sheets.

|| **Grossmann, L.**—Ueber die Anwendung der Bessel'schen Formel in der Meteorologie, insbesondere die Berechnung der Koeffizienten in den Hauptfällen der meteorologischen Praxis. la 4°. Hamburg, 1894. (*Aus. dem Archiv Deutsche Seewarte*, xvii., 1894, *No.* 5.)

Halle, Kaiserliche Leopoldino-Carolinische Deutsche Akademie der Naturforscher.—Leopoldina. Heft xxix., 1893. la. 4°. Halle, 1893.

Hamburg, Deutsche Seewarte.—Annalen der Hydrographie und maritimen Meteorologie. xxii. Jahrg., 1894. la. 8°. Berlin, s.a.

——— ——— Deutsches meteorologisches Jahrbuch für 1893. Beobachtungs-System der Deutschen Seewarte. Ergebnisse der meteorologischen Beobachtungen . . . Jahrg. xvi. sm. f°. Hamburg, 1894.

——— ——— Indischer Ozean. Ein Atlas von 35 Karten, die physikalischen Verhältnisse und die Verkehrs-Strassen darstellend, mit einer erläuternden Einleitung und als Beilage zum Segelhandbuch für den Indischen Ozean. Atlas only. oblong sm. f°. Hamburg, 1891.

——— ——— Resultate meteorologischer Beobachtungen von Deutschen und Holländischen Schiffen für Eingradfelder des nordatlantischen Ozeans. Quadrate 114, 78. Nos. xiii.–xiv. 2 vols. la. 4°. Hamburg, 1894.

——— ——— Vierteljahrs-Wetter-Rundschau an der Hand der täglichen synoptischen Wetterkarten für den nordatlantischen Ocean des Dänischen meteorologischen Instituts und der Deutschen Seewarte. Bd. vi. 1888–89. la. 8°. Berlin, 1894.

——— ——— Wetterbericht. Jahrg. xix. 1894, Jan. 1.–Dec. 31. f°. Sheets.

* **Hanauer, J. E.**—Mud showers and their effect on buildings in Palestine. 8°. (*Quart. Statement, Palestine Explor. Fund*, 1893, *Jan.*, *p.* 69.)

|| **Hann, J.**—Der Regenfall auf den Hawaii-Inseln. sm. f°. (*Meteor. Zeitschr.*, 1895, *Jan.*, *p.* 1.)

|| ——— Die tägliche Periode der Windstärke auf dem Sonnblickgipfel und auf Berggipfeln überhaupt. la. 8°. (*Sitzungsb. k. Akad. Wissensch. Wien, math. naturw. Cl.*, ciii., *Abth.* ii., 1894, *p.* 619.)

|| ——— Ebbe und Fluth im Luftmeer der Erde. Sammlung populärer Schriften herausgegeben von der Gesellsch. Urania zu Berlin, No. 28. la. 8°. Berlin, 1894. (*Himmel und Erde*, vi., *Heft* 8 *u.* 9.)

——— Resultate der meteorologische Beobachtungen auf der Insel Cypern 1887 bis 1891. sm. f°. (*Meteor. Zeitschr.*, 1894, *Feb.*, *Kleinere Mittheil.*, *p.* 67.)

* || **Harrington, M. W.**—Weather making, ancient and modern. la. 8°. (*Nat. Geogr. Mag. Washington*, vi., 1894, *p.* 35.)

* **Hellmann, G.**—Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus herausgegeben von G. Hellmann. No. 4. E. Halley. W. Whiston. J. C. Wilke. A. von Humboldt. C. Hansteen. Die ältesten Karten der Isogonen, Isoklinen, Isodynamen. 1701, 1721, 1768, 1804, 1825, 1826. 4°. Berlin, 1895.

|| ——— Photographien von Schneekrystallen. sm. f°. (*Meteor. Zeitschr.*, 1894, *Aug.*, *p.* 281.)

|| ——— Resultate des Regenmess-Versuchsfeldes bei Berlin, 1885–1891. Abdruck, mit einigen kleinen Aenderungen, aus Berlin. Zweigver. Deutsch. Meteor. Gesellsch., ix. Vereinsjahr, 1892. sm. f°. (*Meteor. Zeitschr.*, 1892, *Mai*, *p.* 173.)

|| ——— Zum 250 jährigen Jubiläum des Barometers. sm. f°. (*Meteor. Zeitschr.*, 1894, *Dec.*, *p.* 445.)

Helsingfors, Finska Vetenskaps-Societeten.—Öfversigt af Finska Vetenskaps-Societetens förhandlingar. xxxv., 1892-93. la. 8°. Helsingfors, 1893.

—— **Institut Météorologique Central de la Société des Sciences de Finlande.**—Observations météorologiques. 1881–1888. 4 vols. f°. Kuopio, 1893–94.

—— —— Observations. Vols. iii.–viii., xi. 1884–1889, 1892. 3 vols. f°. Helsingfors, 1892–1893.

—— **Observatoire Magnétique et Météorologique.**—Observations faites . . . sous la direction de J. J. Nervander. Vols. i.–iv. 4 vols. la. 4°. Helsingfors, 1850.

—— —— Observations. Imprimées aux frais de la Soc. des Sc. de Finlande, Vol. v. la. 4°. Helsingfors, 1873.

* **Hennessey, J. B. N.**—Actinometrical observations made at Dehra and Mussoorie in India, October and November 1869, in a letter to the President. 8°. (*Proc. R. Soc.*, xix., 1870, *p.* 225.)

* —— On actinometrical observations made in India at Mussooree and Dehra, in October and November, 1879. 8°. (*Proc. R. Soc.*, xxxi., 1880, *p.* 154.)

* —— On actinometrical observations made in India at Mussooree in Autumn of 1880, and Summer and Autumn of 1881. 8°. (*Proc. R. Soc.*, xxxiv., 1882, *p.* 45.)

Hennig, R.—Ueber ungewöhnliche Blitzentladungen. la. 4°. (*Naturw. Wochenschr., Berlin*, x., 1895, *p.* 65.)

Hess, C.—Die Hagelschläge in der Schweiz in den Jahren 1883–1893. la. 4°. (*Naturw. Wochenschr., Berlin*, ix., 1894, *p.* 597.)

* **Himmel und Erde.**—Illustrirte naturwissenschaftliche Monatsschrift. Herausgegeben von der Gesellschaft Urania zu Berlin. Redacteur: M. W. Meyer. vi. Jahrg. la. 8°. Berlin, 1894.

Hobart, Royal Society of Tasmania.—Papers and proceedings . . . for 1893. 8°. Hobart, 1894.

* || **Homén, T.**—Bodenphysikalische und meteorologische Beobachtungen mit besonderer Berücksichtigung des Nachtfrostphänomens. la. 8°. Berlin, 1894. (*Bidr. känn. Finl. natur och folk, Heft* 54, *Helsingfors*, 1894.)

Hong-Kong, Observatory.—China coast meteorological register, 1894. sm. f°. s.l.e.a.

—— —— Observations and researches. 1893. f°. Hong-Kong, 1894.

|| **Hoppe, O.**—Oberirdische und unterirdische Wirkungen eines Blitzstrahles. la. 4°. (*Leopoldina*, xxix., 1893.)

* || **Howard, L.**—On the barometrical variation as affected by the moon's declination. Read June 19, 1845. la. 4°. (*Phil. Trans.*, 1846, *p.* 441.)

* **Howitt, Mary.**—Pictorial calendar of the seasons, exhibiting the pleasures, pursuits, and characteristics of country life for every month in the year, and embodying the whole of Aikin's calendar of nature. sm. 8°. London, 1854.

* **Howitt, W.**—The book of the seasons; or, the calendar of nature. 6th ed. sm. 8°. London, 1840.

|| **Hunt, H. A.**—An essay on southerly bursters. 8°. (*Journ. R. Soc. N.S. W.*, xxviii., 1894.)

* **Hutchins, T.**—Experiments for ascertaining the point of mercurial congelation. 4°. (*Phil. Trans. Abridged by Hutton, &c.*, xv., 1809, *p.* 411.)

|| **Innsbruck, Meteorologisches Observatorium der K. K. Universität.**—Meteorologische Beobachtungen, 1891, 1892. 2 vols. 8°. (*Ber. naturw.-med. Ver. Innsbruck*, xx., 1891–92, *p.* 173; xxi., 1892–93.)

|| **Irkutsk, Observatorium.**—Die Beobachtungen des meteorologischen und magnetischen Observatoriums in Irkutsk. 1890–1892. 3 vols. la. 4°. [*Annal. phys. central Obs. St. Petersb.*]

In the Russian language also.

Ithaca, New York Meteorological Bureau.—Annual reports of the Commissioners of the State Meteorological Bureau and Weather Service. 3rd and 4th. 1891, 1892. 2 vols. 8°. Albany, 1892–93.

—— —— —— Annual report of the Meteorological Bureau and Weather Service of the State of New York. 5th. 1893. 8°. Albany, 1894.

Jackson, R.—Ocean passages, compiled from the various sailing directions. 8°. Portsmouth, 1894.

——— The principal winds and currents of the globe; also rainy seasons, ice limits, fogs, and rollers, and revolving storms. 8°. Portsmouth, 1890.

Jamaica.—Jamaica rainfall for the year 1893. f°. Dated, Kingston, 1894.
No. 177 of "Jamaica Weather Report."

‖ ——— Weather report for the months of Jan.–Dec. 1894. sm. f°. Kingston, 1894–95. (*From the "Jamaica Gazette."*)

Jenkins, B. G. — Tellustria: A method for determining astronomically the variations in the temperature and pressure of the atmosphere. Based on English, French, German, and American data, with chart showing forecast readings for 1894 and actual readings to date. 8°. London, 1894.

Kaminskij, A.—Der jährliche Gang und Vertheilung der Feuchtigkeit der Luft in Russland, &c.
See ST. PETERSBURG, K. AKAD. DER WISSENSCH. Repertorium für Meteorologie, vi. Suppl.

‖ **Kammermann, A.**—Résumé météorologique de l'année 1893 pour Genève et le Grand Saint-Bernard. 8°. Genève, 1894. (*Arch. Sc. Phys. Nat.*, 1894, *Oct.*, *Nov.*)

Kassner, C.—Ueber einen vermutheten Zusammenhang zwischen Wolkenwogen und Niederschlägen. sm. f°. (*Meteor. Zeitschr.*, 1894, *Nov.*, *p.* 433.)

Kazan, Observatoire Magnétique de l'Université Impériale.—Observations . . . publiées par D. Goldhammer, 1892. la. 8°. (Kazan), 1894.
In the Russian language also.

‖ **Kew Observatory.**—Report of the Incorporated Kew Committee for the year ending December 31, 1893. 8°. London, 1894. (*Proc. R. Soc.*, lv., 1894, *p.* 307.)

Kiel, Ministerial-Kommission zur Untersuchung der Deutschen Meere.—Ergebnisse der Beobachtungsstationen an den deutschen Küsten über die physikalischen Eigenschaften der Ostsee und Nordsee und die Fischerei. Jahrg., 1893. Oblong 8°. Kiel u. Leipzig, 1895.

* **Klein, H. J.**—Jahrbuch der Astronomie und Geophysik. v. Jahrg., 1894. 8°. Leipzig, 1895.

(Klengel, F.)—Das meteorologische Observatorium auf dem Mont Ventoux (1908 m) in Süd-Frankreich. la. 4°. (*Wissensch. Beil. Leipzig. Zeitung*, 1894, *No.* 53, *p.* 209.)

‖ ——— Über die aperiodischen Schwankungen der Temperatur im Gebiet des Pic du Midi und Puy de Dôme sowie über die Ableitung 30 jähriger Normalmittel für beide Gipfelstationen. la. 8°. Prag, 1894. (*Sitzungsb. K. böhm. Gesellsch. Wissensch., math.-naturw. Cl.*, 1894.)

Klossovsky, A. — Distribution annuelle des orages à la surface du globe terrestre. la. 4°. (Odessa, 1894.)

——— Organisation de l'étude climatérique spéciale de la Russie et problèmes de la météorologie agricole. la. 4°. Odessa, 1894.

Koudritzki, M.—Données nouvelles pour la question de l'influence des forêts sur le climat. la. 8°. (*Mém. Soc. Nat. Kiew.*, xi., 1890, *p.* 173.)
In the Russian language.

——— Les observations météorologiques de la station météorologique de Korostyscheff. 1889–90. 2 vols. la. 8°. (*Mém. Soc. Nat. Kiew.*, xi.–xii., 1891–92.)

Krasno, Agrarmeteorologisches Observatorium des Neutrathaler landwirtschaftlichen Vereines. — Der Laubfrosch. vii. Jahrg., 1894. xi. Jahrg. der populären meteor. Abhandlungen . . . Redigirt durch Frh. G. Friesenhof. la. 4°. Alt-Krasno, 1894.

Lagos, Colonial Surgeon.—Meteorological observations taken at Lagos. 1894, Jan.–Dec. f°. Sheets. (*Gov. Gazette*, 1894.)

La Guardia, Observatorio Meteorológico del Colegio de la Compañia de Jesus.—[Publicados. Cuaderno primero.] Resumen de las observaciones meteorológicas efectuadas en el Colegio de la Guardia, . . . durante el decenio de 1881 á 1890, é indicaciones sobre el clima de aquella localidad, por el P. Don B. Merino. Publicado por el Observatorio de Madrid. 8°. Madrid, 1891.

La Guardia, Observatorio Meteorológico del Colegio de la Compañía de Jesus.—[Cuadernos publicados, No. iii.] Contiene 1°. Un estudio acerca del agua meteórica. 2°. Nota sobre la temperatura en el año 1893. 3°. Las observaciones meteorológicas de los años 1892 y 1893. 8°. Tuy, 1894.

* **La Hire, — de.** — Observations de la pesanteur de l'atmosphére faites au Château de Meudon avec le baromètre double de M. Hugens. sm. 4°. (*Mém. Acad. R. Sc., ? Paris*, 1709, *p.* 176.)

Lahore, Meteorological Reporter to Government, Punjab.—Summary of meteorological conditions prevailing over the Punjab. 1894. Jan.-Dec. f°. Sheets.

——— **Sanitary Commissioner.**—Report on the Sanitary Administration of the Punjab for the year 1893. f°. Lahore, 1894.

* **Lambert, —.** Sur la densité de l'air. Tiré des Mém. Acad., Berlin, 1774. 4°. (*Observ. sur la physique, &c., Paris*, xviii., 1781, *p.* 126.)

Lancaster, A.—Études climatologiques. la. 8°. Bruxelles, 1894.

——— Les fortes pluies d'octobre, 1894. la. 8°. s.l.e.a.

* **Langley, S. P.**—Sunlight and the earth's atmosphere. Lecture delivered at R. Inst. Great Britain, April 17, 1885. la. 8°. (*Pop. Sc. Monthly*, xxvii., *p.* 643.)

‖ ——— The internal work of the wind. sm. f°. Washington, 1893. (*Smithsonian Contrib.*, xxvii., *No.* 884.)

* **Laplace, [C. P. T.].** — Campagne de circumnavigation de la Frégate l'Artémise, pendant les années, 1837–1840. Tomes i.–iv. 4 vols. la 8°. Paris, 1841–43.

* ——— Voyage autour du monde par les mers de l'Inde et de Chine, exécuté sur la corvette de l'État La Favorite pendant les années, 1830–1832. Tomes i.–iv. 4 vols. la. 8°. Paris, 1833–35.

* **Le Roy, [C.].**—Mémoire sur l'élévation et la suspension de l'eau dans l'air, et sur la rosée. 4°. (*Mém. Acad. R. Sc., Paris*, 1751, *p.* 481.)

‖ **Less, E.**—Die Vertheilung des Luftdruckes über Europa während der Trockenzeiten des Frühlings und Sommers 1893. sm. f°. (*Meteor. Zeitschr.*, xxix., 1894, *p.* 121.)

* **Ley, W. C.**—Cloudland: a study on the structure and characters of clouds. la. 8°. London, 1894.

Lisbon, Observatorio Do Infante D. Luiz.—Boletim meteorologico. 1894, Jan. 1–Dec. 31. f°. Sheets.

Liverpool Observatory.—Extracts from the report of the Director of the Observatory to the Marine Committee, and meteorological results deduced from observations taken . . . . during the years 1892 and 1893. la. 8°. Liverpool, 1894.

* ‖ **Lloyd, H.**—Miscellaneous papers connected with physical science. 8°. London, 1877. (*Reprinted from Trans. R. Irish Acad.; Rep. Br. Assoc. Advanc. Sc., &c.*)

Lloyd's Seaman's Almanac.—1895. 8°. London, [1894].

London, Admiralty.—Tide tables for the British and Irish Ports, for the year 1895; also the times and heights of high water at full and change for the principal places on the Globe. la. 8°. London, s.a.

——— ——— **Hydrographic Department.**—Australia directory. Vol. iii. 3rd ed. la. 8°. London, 1895.

——— ——— ——— Catalogue of Admiralty charts, plans, and sailing directions, 1895. la. 8°. London, s.a.

——— ——— ——— List of time signals established in various parts of the world. 4th ed., 1895. la. 8°. London, [1895].

——— ——— ——— North Sea pilot. Part i. Shetland and Orkneys. 4th ed. la. 8°. London, 1894.

——— ——— ——— Norway pilot. Part ii. From the Naze to the North Cape; thence to Jacob River. 2nd ed. la. 8°. London, 1894.

——— ——— ——— Sailing directions for the South-East coast of Nova Scotia and Bay of Fundy. Fourth edition. la. 8°. London, 1894.

London, Admiralty, Hydrographic Department.—Sailing directions for the West Coast of Scotland: the Mull of Galloway to Cape Wrath, including the Hebrides or Western Islands. 4th ed. la. 8°. London, 1894.

——— ——— ——— The China Sea directory. Vols. iii. and iv. Third edition. 2 vols. la. 8°. London, 1894.

——— ——— ——— The Mediterranean pilot. Vol. i. Third edition. la. 8°. London, 1894.

——— ——— ——— The St. Lawrence pilot, comprising sailing directions for the gulf and river. Vol. i. Sixth edition. la. 8°. London, 1894.

——— **Army Medical Department.** — Annual abstract of meteorological observations taken at Netley and foreign stations in the years 1891, 1892. 2 vols. la. 8°. (*Army Med. Dep. Rep.*, 1892, *p.* 410; 1893, *p.* 368.)

——— **Board of Agriculture.** — Agriculture produce statistics of Great Britain, showing the estimated total produce and average yield per acre of the principal crops, with abstract returns for the United Kingdom, 1893. la. 8°. London, 1894.

——— **Board of Trade.** — Abstracts of the returns made to the Board of Trade of shipping casualties . . . from the 1st July 1892 to the 30th June 1893. . . . with charts and appendices. sm. f°. London, 1894.

——— **British Association for the Advancement of Science.**—Report. Nottingham, 1893. Oxford, 1894. 2 vols. 8°. London, 1894.

* ——— **Edinburgh, and Dublin Philosophical Magazine** and Journal of Science. Fifth series. Vols. xxxvii.-xxxviii., 1894. 2 vols. 8°. London, s.a.

——— **General Register Office.**—Annual report of the Registrar-General of births, deaths, and marriages in England. 55th and 56th, 1892–93. 2 vols. la. 8°. London, 1894.

——— ——— Annual summary of births, deaths, and causes of death in London and other great towns. 1893. la. 8°. London, 1894.

——— ——— Quarterly returns of marriages, births, and deaths registered in . . England, Nos. 181–184, 1894. la. 8°. London, 1894–95.

——— ——— Weekly return of births and deaths in London and . . . other great towns. Vol. lv., 1894. la. 8°. London, 1894.

London, Meteorological Office.—A barometer manual for the use of seamen. Second edition. la. 8°. London, 1894.

——— ——— Daily weather report. 1894, Jan. 1–Dec. 31. 2 vols. la. 4°. s.l.e.a.

——— ——— Meteorological observations at stations of the second order for the year 1890. la. 4°. London, 1894.

——— ——— Report of the Meteorological Council to the Royal Society, for the year ending 31st of March 1894. la. 8°. London, 1894.

——— ——— The weekly weather report of the Meteorological Office for the year 1894 (vol. xi., 3rd series), containing synoptic charts, and descriptive summaries of the weather for each day; also tabular summaries of temperature, rainfall, and bright sunshine for each week, with monthly supplements and two appendices. la. 4°. London, 1895.

* ——— **Nautical Almanac Office.**—The nautical almanac and astronomical ephemeris for the year 1895, for the meridian of the Royal Observatory at Greenwich. la. 8°. London, s.a.

——— **Royal Astronomical Society.**—Monthly notices. Vol. liv., 1893–94. 8°. London, 1894.

——— **Royal Botanic Society.**—Quarterly record. Vol. iv., 1889–1891. 8°. London, 1892.

——— **Royal Geographical Society.**—The geographical journal. Including the proceedings of the Royal Geographical Society. Vols. iii.–iv., 1894. 2 vols. la. 8°. London, 1894.

* ——— **Royal Horticultural Society.**—Report on the instruments employed in, and on the plan of a journal of, meteorological observations kept in the garden of the Horticultural Society at Chiswick. 4°. (*Trans. Hortic. Soc.*, vii., 1826, *p.* 97.)

* ‖ ——— ——— Report upon the meteorological observations made in the garden of the Horticultural Society, during the year 1825. 4°. London, 1826. (*Trans. Hortic. Soc.*, vi., *p.* 398.)

For continuation, see Booth, W. B.

London, Royal Meteorological Society.—The meteorological record. Monthly results of observations made at the stations of the R. Meteor. Soc., with remarks on the weather. By W. Marriott. Vol. xiii., 1893. la. 8°. London, 1894.
Contains also "Meteorology of England during the quarters ending March to December 1893." By J. Glaisher.

——— ——— Quarterly Journal. Vol. xx., 1894. la. 8°. London, 1894.

——— **Royal National Lifeboat Institution.**—The lifeboat. Vol. xv., 1892–94. la. 8°. London, 1895.

——— **Royal Society.**—Catalogue of scientific papers. 1874–83. Vol. x. 4°. London, 1894.

——— ——— Proceedings. Vols. lv.–lvi., 1894. 2 vols. 8°. London, 1894.

——— **Royal United Service Institution.**—Journal. Vol. xxxviii. 8°. London, 1894.

——— **Society of Arts.**—Journal. Index to vols. xxxi.–xl., 1882–92. la. 8°. London, 1895.

——— ——— Journal. Vol. xlii., 1893–94. la. 8°. London, 1894.

McAdie, A.—Protection from lightning.
See Washington, Department of Agriculture, Weather Bureau.

Macpherson, W. G.—Remarks on the population and meteorology of the interior of northern Morocco, and on the diseases and medical customs prevalent amongst the inhabitants. la. 8°. (*Army Med. Dep. Rep.*, xxxiv., 1892, *p.* 349.)

Madrid, Instituto Central Meteorológico.—Boletin. 1894, Jan. 1–Dec. 31. sm. f°. Sheets.

——— **Observatorio.**—Observaciones meteorológicas efectuadas en el observatorio de Madrid durante los años 1892 y 1893. 8°. Madrid, 1894.

Magdeburg.—Jahrbuch der meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung. Herausgegeben von A. W. Grützmacher. Bd. xi.–xii. Jahrg. xii–xiii., 1892–93. 2 vols. la. 4°. Magdeburg, 1893–94.

Makaroff, S.—Le "Vitiaz" et l'Océan Pacifique. Observations hydrologiques faites par les Officiers de la corvette "Vitiaz," pendant un voyage autour du monde, executé de 1886 à 1889, et recueil des observations sur la température et le poids spécifique de l'eau de l'Océan Pacifique Nord. Vols. i.–ii. in one. sm. f°. St. Pétersbourg, 1894.
In the Russian language also.

Manchester Literary and Philosophical Society.—Memoirs and proceedings. 4th series. Vol. viii. 8°. Manchester, 1894.

——— **Public Health Office.**—Quarterly returns of the Medical Officer of Health. 1894. la. 8°. Manchester, s.a.

——— ——— Weekly returns of the Medical Officer of Health. 1894. la. 8°. Manchester, s.a.

——— **Sheffield, and Lincolnshire Railway.**—Monthly statement of rain fallen in the year ending 31st December 1894. sm f°. Sheet.

Manila, Observatorio Meteorológico.—La meteorologia en la Exposición Columbina de Chicago, 1893. Memoria escrita por los PP. F. Faura y J. Algué, Comisionados del Gobierno Español. sm. f°. Barcelona, 1894.

——— ——— Observaciones. 1892. f°. Manila, 1893–4.

Margate, Medical Officer of Health.—Annual report of the Medical Officer of Health for the year 1893, to which is appended the meteorological report 8°. Margate, 1894.

|| **Marriott, W.**—Audibility of "Big Ben" at West Norwood under certain meteorological conditions. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xx., 1894, *p.* 243.)

|| ——— Comparative observations with two sets of instruments at Ilfracombe, North Devon, during 1893. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xx., 1894, *p.* 164.)

|| ——— Moisture, its determination and measurement. 8°. (*Journ. San. Inst.*, xv., 1894, *p.* 200.)

|| ——— Thunder and hail storms over England and the south of Scotland. July 8th, 1893. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xx., 1894, *p.* 31.)

|| **Mathiesen, Général.**—Les courants de la mer et leur origine. la. 8°. Paris, 1895. (*Rev. mar. et col.*, 1894, *Oct.*)

|| **Mauritius, Royal Alfred Observatory.**—Results of meteorological observations taken during the year 1893, at the Royal Alfred Observatory, Mauritius. sm. f°. (*Mauritius Blue Book*, 1893.)

Mazatlan, Observatorio Astronómico Meteorológico.—Cuadro que manifiesta la cantidad de lluvia caida durante los años de 1880 á 1891. la. f°. Sheet. Dated, Mazatlan, 1892.

——— ——— Resumen general de las observaciones meteorológicas practicadas en la Direccion del Observatorio de Mazatlan, durante el año de 1893. la. f°. Sheet. Dated, Mazatlan, 1894.

Meinardus, W.—Beiträge zur Kenntniss der klimatischen Verhältnisse des nordostlichen Theils des Indischen Ozeans. 4°. Altona, 1894.

|| ——— Ueber die Methoden der Verarbeitung von meteorologischen Beobachtungen zur See. 8°. (*Zeitschr. Gesellsch. Erdk. Berlin*, xxix., 1894.)

Melbourne Observatory.—Record of results of observations in meteorology and terrestrial magnetism made at the Melbourne Observatory, and at other localities in the Colony of Victoria, Australia. 1893, Jan.–Dec. la. 8°. Melbourne, s.a.

Mellish, H.—The weather of 1894, at Hodsock Priory, Worksop. 8°. s.l.e.a.

* **Melville, G. W.**—In the Lena delta. A narrative of the search for Lieut.-Commr. De Long and his companions, followed by an account of the Greely relief expedition and a proposed method of reaching the North Pole. By G. W. Melville. Edited by M. Philips. 8°. London, 1885.

Meteorologische Zeitschrift.—Herausgegeben im Auftrage der Oesterreichischen Gesellschaft für Meteorologie und der Deutschen Meteorologischen Gesellschaft. xi. Jahrg. (xxix. Bd. d. Zeitschr. oesterr. Gesellsch. Meteor.) 1894. la. 8°. Wien, s.a.

Mexico, Sociedad Cientifica "Antonio Alzate."—Memorias. Tomo, vii. 1893–94. 8°. México, 1893.

Title page in French language also.

Milan, R. Osservatorio Astronomico di Brera in Milano.—Osservazioni meteorologiche eseguite nell' anno 1894, col riassunto composto sulle medesime da E. Pini. sm. f°. s.l.e.a.

|| **Mill, H. R.**—The Clyde sea area. Part iii. Distribution of temperature. la. 4°. Edinburgh, 1894. (*Trans. R. Soc. Edinb.*, xxxviii., *Part* 1, 1893–94.)

Monte Video, Sociedad Meteorológica Uruguaya.—[Revista mensual.] 1892, July–Dec. sm. f°. Monte Video, 1892–93.

* **Moore, J. W.**—Meteorology: practical and applied. sm. 8°. London, 1894.

|| **Munich K. b. meteorologische Centralstation.**—Uebersicht über die Witterungsverhältnisse im Königreiche Bayern. 1894, Jan.–Dec. la. f°. Sheets. (*Separat-Abdruck aus der "Augsburger-Abendzeitung."*)

——— ——— Wetterkarte und Wetterbericht. 1894, Jan. 1–Dec. 31. Oblong f°. Sheets.

* **Nature.**—A weekly illustrated journal of science. Vols. xlix.–l. 1893–94. 2 vols. la. 8°. London and New York, s.a.

* **Nature, La.**—Revue des sciences et de leurs applications aux arts et à l'industrie. Journal hebdomadaire illustré. xxiiᵉ année, 1894. 1ᵉʳ et 2ᵉ Semestres. 2 vols. sm. f°. Paris, s.a.

* **Nautical Magazine** and Journal of the Royal Naval Reserve. Enlarged series. Vol. lxiii., 1894. la. 8°. London, s.a.

Nemuro, Japan.—Report of the meteorological observations made at Nemuro, Japan. 1889, 1890. Published by Hokkaido Cho. 2 parts. sm. f°. s.l.e.a.

In the Japanese language also.

* **Neumayer, G.**—On the lunar atmospheric tide at Melbourne. 8°. (*Proc. R. Soc.*, xv., 1867, *p.* 489.)

New York, American Geographical Society.—Journal. Vol. xxvi., 1894. la. 8°. New York, s.a.

New York, Meteorological Observatory.—Report. 1894. 4°. New York, 1894.

Nice, Société de Médecine et de Climatologie de Nice.—Nice-Médical. 18e année, 1893-94, Nos. 1-12. la. 8°. Nice, 1893-94.

* **Nollet, [J. A.]**—Examen d'un mémoire envoyé à l'Academie, dans lequel il s'agit de plusieurs faits concernant les baromètres. 4°. (*Mém. Acad. R. Sc., Paris*, 1751, *p.* 275.)

[Northampton, Northamptonshire Natural History Society.]—Meteorological report. 1889-94. 8°. [? Rep. Northampton Nat. Hist. Soc.]

* || **O'Brien, G.**—On certain climatic phenomena of the northern coast of the Republic of Chili. 8°. London, 1892. (*Min. Proc. Inst. Civ. Eng.*, cix., 1891-92.)

Odessa, Meteorologisches Observatorium der Neurussischen Universität.—Meteorologische Beobachtungen. 1892. Jan.-Dec. f°.
In the Russian language also.

[——— **Observatoire Météorologique de l'Université.**]—Revue météorologique. Travaux du réseau météorologique du sud-ouest de la Russie. 1893. Vol. vi. Par A. Klossovsky. la. 4°. Odessa, 1894.
Text in the Russian language.

O-Gyalla, Meteorologisches—Magnetisches Central-Observatorium.—Beobachtungen. 1893, April-Dec. 1894, Jan.-Dec. la. 8°. Budapest, 1893-94.
In the Hungarian language also.

Paris, Académie des Sciences.—Comptes rendus hebdomadaires des séances. . . . Tomes, cxviii.-cxix. 1894. 2 vols. 4°. Paris, 1894.

——— **Bureau Central Météorologique de France.**—Annales . . . publiées par E. Mascart. Année 1892. i.-iii. 3 vols. la. 4°. Paris, 1894.

——— ——— Bulletin international. xxxviiie année, 1894. Jan. 1-Dec. 31. 4°.

——— **Ministère de la Marine et des Colonies.**—Revue maritime et coloniale. Tomes cxx.-cxxiii. 4 vols. la. 8°. Paris, 1894.

——— **Service Hydrographique de la Marine.**—Annales hydrographiques. 2e sér. Tome xvi. 1894. la. 8°. Paris, 1894.

——— **Société Météorologique de France.**—Annuaire. Tome xli. 1893. la. 8°. Paris, s.a.

* **Parkinson, T.**—A system of mechanics and hydrostatics, being the substance of lectures upon those branches of natural philosophy. 4°. Cambridge, 1789.

Parsons, Laurence.—See Rosse, Earl of.

* **Paulsen, A.**—Sur la nature et l'origine de l'aurore boréale. la. 8°. Copenhague, 1894. (*Bull. Acad. R. Sc. et Lettres*, 1894, *p.* 148.)

Peek, C. E.—Meteorological observations for the year 1893. Rousdon Observatory, Devon. Vol. x. 4°. London, 1894.

Peking, Inspectorate General of Customs.—Medical reports for the half-years ended 31st March and 30th September 1891. 41st and 42nd Issues. 2 vols. 4°. Shanghai, 1894.

|| **Pernter, J. M.**—Zur Erklärung des täglichen Ganges der Windgeschwindigkeit. la. 8°. Wien, 1893. (*Sitzungsb. k. Akad. Wissensch. Wien, math.-naturw. Cl., Bd.* cii., *Abth.* 2, *p.* 979.)

|| ——— Die Niederschlagsverhältnisse der Umgebung von Bozen in den Jahren 1891-1893. 8°. (*Ber. naturw.-med. Ver. Innsbruck*, xxi., 1892-93.)

——— Die Wolken. Vorträge des Ver. Verbr. naturw. Kenntn. Wien. xxxiii. Jahrg., Heft. ii. sm. 8°. Wien, 1893.

Pesth, Königl. Ung. Central-Anstalt für Meteorologie und Erdmagnetismus.—Jahrbücher. xxi. Bd., Jahrg. 1891. 4°. Budapest, 1894.
In the Hungarian language also.

Petella, J.—Massaua ed Assab. Saggio di topo-idrografia e climatologia comparate. xi. Congresso medico internazionale. la. 8°. Roma, 1894.

Petermann's (Dr. A.) Mitteilungen aus Justus Perthes' geographischer Anstalt. Herausgegeben von A. Supan. 40 Bd., 1894. 4°. Gotha, s.a.

——— ——— aus Justus Perthes' geographischer Anstalt. Herausgegeben von A. Supan. Ergänzungsband xxiv. la. 8°. Gotha, 1895.

Philadelphia, American Philosophical Society.—Proceedings. Vol. xxxii. 1893. Proceedings commemorative of the 150th anniversary of the foundation of Amer. Phil. Soc., May 23–26, 1893. la. 8°. Philadelphia, 1894.

——— ——— Proceedings of the American Philosophical Society held at Philadelphia for promoting useful knowledge. Vol. xxxiii., 1894. la. 8°. Philadelphia, 1894.

——— **Franklin Institute.**—The journal of the Franklin Institute devoted to science and the mechanic arts. Vols. cxxxvii.–cxxxviii., 1894. 2 vols. 8°. Philadelphia, 1894.

Philips, M.—In the Lena delta. See MELVILLE, G. W.

Plymouth.—First annual meteorological report by H. V. Prigg. 1893. 6°. Plymouth, 1894.

Pola, hydrographisches Amt der k. k. Kriegsmarine.—Meteorologische und magnetische Beobachtungen. 1894, Jan.–Dec., and Results. oblong la. 8°.

——— **K. K. hydrographisches Amt.**—Mittheilungen aus dem Gebiete des Seewesens. Jahrg. 1894. xxii. Band. la. 8°. Pola, 1894.

Polis, P.—Ergebnisse der 1894 in Aachen von der meteorologischen Station Aachen angestellten Beobachtungen. 4°. Sheet.

|| ——— Die Gewitter-Erscheinungen in Aachen am 27 August 1894. la. 8°. (*Das Wetter*, xi., 1894, *p.* 221.)

|| **Port au Prince, Haiti.**—Täglicher Gang des Barometers zu Port au Prince nach zweijährigen Beobachtungen 1890–92 des Herrn Prof. P. J. Scherer, nebst einer Übersicht der bisherigen Beobachtungsergebnisse zu Port au Prince 1865–69 von Prof. A. Ackermann und 1888–1893 von Prof. J. Scherer. la. 4°. (*Jahrb. K. K. Central-Anstalt. Meteor., Wien*, 1893, *Anhang.*)

|| ——— [Tägliche meteorologische Beobachtungen] 1890–1892. la. 4°. (*Jahrb. K. K. Central-Anst. Meteor., Wien*, 1890–92, *p.* 121.)

Porto Rico, Jefatura de Obras Públicas de la Isla de Puerto Rico.—Resúmen de las observaciones meteorológicas verificadas. 1894. Jan.–Dec. 8°. Sheets.

Prague, K. K. Sternwarte.—Magnetische und meteorologische Beobachtungen . . . 1893. 54 Jahrg. la. 4°. Prag, 1894.

Prague, Technisches Bureau des Landesculturrathes für das Königreich Böhmen.—Ergebnisse der ombrometrischen Beobachtungen in Böhmen. 1893. 4°. Prag, 1894.

In the Czech language also.

——— ——— Ergebnisse der Wasserstandsbeobachtungen an den Flüssen Böhmens. 1893. 4°. Prag, 1894.

Prigg, H. V.—Meteorological report. See PLYMOUTH.

Prince, C. L.—The summary of a meteorological journal kept . . . . at Crowborough Hill, Sussex. 1893, 1894. 2 parts., sm. f°. s.l.e.a.

Puebla, Colegio Catolico del Sagrado Corazon de Jesus.—Observaciones meteorológicas. 1879. sm. f°. s.l.e.a.

——— ——— Resúmen de las observaciones meteorológicas. 1887–1889. 2 sheets, oblong sm. 8°. and 1 vol., la. 8°. Puebla, 1890.

——— **Observatorio Meteorológico del Colegio del Estado de Puebla.**—Resúmen correspondiente a cada dia. 1893–1894. Jan.–Dec. sm. f°.

|| **Rajna, M.**—Sull' escursione diurna della declinazione magnetica a Milano in relazione col periodo delle macchie solari. la. 8°. (*Rend. R. Ist. Lombardo Sc. Lett., serie* ii., xxviii., 1895.)

* **Ravenstein, E. G.**—Report on meteorological observations in British East Africa for 1893. la. 8°. London, 1894.

|| **Ricco, A. e Arcidiacono, S.**—Osservazioni puteometriche. la. 8°. (*Boll. mens. accad. cioenia sc. nat. Catania*, xxxvii., 1894.)

|| ——— **A. e Saija, G.**—Confronto della temperatura all' osservatorio Etneo ed all' osservatorio di Catania. la. 8°. (*Boll. mens. accad. cioenia sc. nat. Catania*, xxxvii., 1894.)

* **Richardson, J.**—Daily tables (with averages) of temperature and rainfall [at Farovohitra, Antananarivo]. 1890–1892. 3 parts. 8°. (*Antananarivo Ann. and Madagascar Mag.*, iv., *No.* 14, 1890; *No.* 15, 1891, *p.* 382; *No.* 16, 1892, *p.* 505.)

1890 is in MS. See also SHARMAN, J.

|| **Riggenbach, A.** — Witterungs-Übersicht des Jahres 1893. 8°. (*Verh. naturf. Gesellsch. Basel*, x., *pp.* 425 *u.* 434.)

Contains also "Die Niederschlags-Verhältnisse des Kantons Basel und ihre Beziehung zur Bodengestalt."

Rio de Janeiro, Observatorio. — Annuario. 1894. Anno x. sm. 8°. Rio de Janeiro, 1893.

Riposto, Osservatorio Meteorologico del R. Istituto Nautico.—Bollettino mensile. Anno xx., 1894. Fasc. 1–12. sm. f°. Riposto, 1894.

Rome, Specola Vaticana. — Pubblicazioni. Fasc. iv. sm. f°. Roma, 1894.

——— **Ufficio Centrale di Meteorologia e di Geodinamica.**—Bollettino meteorico. Anno xvi., 1894. Jan. 1–Dec. 31. la. 4°. Sheets.

——— ——— Rivista Meteorico-Agraria. Anno xv., 1894, N. 1–36. la. 8°. and sm. f°. (Roma, 1894–95.)

* || **Rosse, Laurence (Earl of).**—On the radiation of heat from the moon, the law of its absorption by our atmosphere, and of its variation in amount with her phases. la. 4°. (*Phil. Trans.*, 1873, *p.* 587.)

|| **Rotch, A. L.** — Meeting of the International Meteorological Committee. [Upsala, 1894.] la. 8°. (*Amer. Meteor. Journ.*, 1894, *Dec.*)

|| ——— The Meteorological Services of South America. la. 8°. (*Amer. Meteor. Journ.*, 1894, *Sept. and Oct.*)

Rugby School Natural History Society. — Report . . . for the year 1894. 8°. Rugby, 1895.

Rung, G.—Répartition de la pression atmosphérique sur l'Océan Atlantique septentrional d'après les observations de 1870 à 1889, avec la direction moyenne du vent sur les littoraux. la. f°. Copenhague, 1894.

* || **Sabine, E.**—Contributions to terrestrial magnetism. No. ii. la. 4°. (*Phil. Trans.*, 1841, *p.* 11.)

[St. Petersburg, Ghlavn. Fiz. Observatoriya. — Ezhemyesyachn'ii meteorologhicheskii byulleten dlya Evropeiskoi Rossii.] (St. Petersburg, Central Physical Observatory. Monthly meteorological bulletin.) (1894. ii. la. 4°. [Sanktpeterburgh,] 1895.

St. Petersburg, Kaiserliche Akademie der Wissenschaften.—Repertorium für Meteorologie. . . . Redigirt von H. Wild. Bd. xvii. sm. f°. St. Petersburg, 1894.

——— ——— Repertorium für Meteorologie. vi. Suppl. Der jährliche Gang und die Vertheilung der Feuchtigkeit der Luft in Russland nach den Beobachtungen von 1871–1890, von A. Kaminskij. sm. f°. St. Petersburg, 1894.

——— **Observatoire Physique Météorologique.**—Bulletin météorologique. 1894, Jan. 1–Dec. 31. f°. Sheets.

In the Russian language also.

——— **Physikalisches Central-Observatorium.**—Annalen . . . herausgegeben von H. Wild. Jahrg. 1893. Theil i. und ii. 2 vols. sm. f°. St. Petersburg, 1894.

[——— **Scientific Department of the Naval Technical Committee.**]—Naval Repertory. 1894. Nos. 1–7, 9–11. la. 8°. St. Petersburg, 1894.

In the Russian language.

St. Vincent, Botanic Gardens.—Meteorological return, 1894, Jan.–Dec. sm. f°. Sheets.

São Paulo, Commissão Geographica e Geologica.—Boletim. vol. i., N. 8. Dados climatologicos, 1890. (Por A. Loefgren.) 8°. S. Paulo, 1891.

——— ——— Dados climatologicos. 1891, 1892. 2 vols. 8°. S. Paulo, 1893.

Sapporo, Japan.—Report of the meteorological observations made at Sapporo, Japan, 1890. Published by Hokkaido Cho. sm. f°. s.l.e.a.

In the Japanese language also.

* **Schmidt, A.**—Über die Verwendung trigonometrischer Reihen in der Meteorologie. Programm des herzoglichen Gymn. Ernestinum zu Gotha . . . 17 März, 1894. 4°. Gotha, 1894.

|| **Schreiber, [P.]**—Ableitung der sogenannten Trägheitscurve auf der Erdoberfläche. la. 4°. (*Leopoldina*, xxx., 1894.)

|| ——— **P.** Die Zustandsgleichungen einer Luftsäule. Barometrische Höhenformel. Zweite Mittheilung. Vorgetragen in der Sitz. Zweigver. Chemnitz, 24 Apl. 1894. la. 4°. (*Civilingenieur*, xl., *Heft* 4.)

* **Science Progress.**—A monthly review of current scientific investigation. Conducted by H. C. Burdett, edited by J. B. Farmer. vols. i.–ii. 1894–1895. 2 vols. la. 8°. London, 1894.

* **Scoresby, W., Jun.**—Meteorological journals, kept during voyages from Whitby to Greenland, and back again, on board the ship "Resolution," in the years 1807, 1808, and 1809. 8°. [*Mem. Werner. Nat. Hist. Soc. Edinb.*, I., 1810, *p.* 249.]

* ——— Meteorological observations on a Greenland voyage, in the ship "Resolution," in the years 1810 and 1811. 8°. [*Mem. Werner. Nat. Hist. Soc. Edinb.*, I., 1810, *p.* 609; II., 1812, *p.* 155.]

|| **Scott, R. H.**—Barometrical conditions and air movements. 8°. (*Journ. San. Inst.*, xv., *Part* ii., 1894, *p.* 188.)

|| ——— Fogs reported with strong winds during the 15 years 1876–90 in the British Isles. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xx., 1894, *p.* 253.)

Seeland, F.—Magnetische und meteorologische Beobachtungen zu Klagenfurt. Dec. 1893–Dec. 1894 and year. 8°. s.l.e.a.

Shanghai Meteorological Society.—Second annual report for the year 1893 on the typhoons of the year 1893. By F. S. Chevalier. la. 8°. Zi-ka-wei, 1894.

* **Sharman, J.**—Daily tables of the temperature and rainfall at Farovohitra, Antananarivo. 1893. 8°. (*Antananarivo Ann. and Madagascar Mag.*, v., *No.* 17, 1893, *p.* 125.)

For previous years see RICHARDSON, J.

* **Simpson, Sir George.**—Narrative of a journey round the world, during the years 1841 and 1842. Vols. i.–ii. 2 vols. la. 8°. London, 1847.

Singapore, Principal Medical Officer, Straits Settlements.—Annual meteorological report, Straits Settlements, for the year 1893. sm. f°. s.l.e.a.

|| **Singer, K.**—Wolkentafeln. f°. München, 1892. [*Beob. Meteor. Stationen K. Bayern*, xiii., 1891.]

Text in English and French also.

Sofia, Station Central Météorologique de Bulgarie.—Bulletin mensuel. 1894, Jan.–Dec. and year. oblong la. 8°. Sheets.

In the Russian language also.

|| **Sohncke, L.**—Gewitterstudien auf Grund von Ballonfahrten. 4°. München, 1894. (*Abhandl. k. bayer. Akad. Wissensch.*, ii. *Cl.*, xviii. *Bd.*, iii. *Abth.*, *p.* 593.)

|| ——— **und Finsterwalder, S.**—Die erste wissenschaftliche Nachtfahrt des Münchener Vereins für Luftschiffahrt. la. 4°. (*Beob. meteor. Station. k. Bayern.*, xv., 1893.)

——— ——— Die zweite wissenschaftliche Nachtfahrt des Münchener Vereins für Luftschiffahrt am 8 Juli 1893, Morgens 3 Uhr. la. 4°. (*Beob. meteor. Station. k. Bayern*, xv., 1893.)

Southport, Fernley Observatory.—Report, and results of observations, for the year 1893. By J. Baxendell. 4°. Southport, [1894.]

|| **Steinbach, —.**—Bemerkungen über das Klima von Jaluit. la. 8°. Berlin, 1894. (*Mittheil. deutsch. Schutzgeb.*, vii., 1894, *Heft* 4.)

|| **Stelling, E.**—Magnetische Beobachtungen im Ostsibirischen Küstengebiete im Jahre 1890 nebst Bemerkungen über die Änderungen der erdmagnetischen Elemente daselbst. sm. f°. St. Petersburg, 1894. (*Repert. Meteor.* xv., *No.* 5.)

|| **Sterneck, R. von.**—Die Polhöhe und ihre Schwankungen, beobachtet auf der Sternwarte des k. und k. militär-geographischen Institutes zu Wien. la. 8°. Wien, 1894. (*Mittheil. k. k. milit. geogr. Inst.*, xiii., 1893.)

|| ——— Relative Schwerebestimmungen ausgeführt im Jahre 1893. la. 8°. Wien, 1894. (*Mittheil. k. k. milit. geogr. Inst.*, xiii., 1893.)

* **Stewart, B.**—Meteorology of the sun and earth. Opening address in Section A, at the Bristol Meeting of the British Assoc. la. 8°. (*Pop. Sc. Monthly*, viii., *p.* 75.)

Stockholm, Kongl. Svenska Vetenskaps-Akademie.—Meteorologiska Iakttagelser i Sverige utgifna af Kongl. Svenska Vetenskaps-Akademien, anstälda och utarbetade under inseende af meteorologiska Central-Anstalten. Bd. xxxi.–xxxii., 2 dra. ser., Bd. 17, 18. 1889–1890. 2 vols. la. 4°. Stockholm, 1893–94.

In the French language also.

——— **Meteorologiska Central-Anstalt.**—Månadsöfversigt af väderleken i Sverige till landtbrukets tjenst utgifven under meteorologiska Central-Anstaltens inseende af Dr. H. E. Hamberg. Årgång xiv. 1894. f°. Stockholm, 1894.

Stonyhurst College Observatory.—Results of meteorological, magnetical, and solar observations. By the Rev. W. Sidgreaves. 1894. sm. 8°. Clitheroe, 1895.

The Appendix contains "Results of meteor. obsns. taken at St. Ignatius' College, Malta, by the Rev. J. Dobson. 1894."

Straits Settlements.—Annual report of the State of Selangor for the year 1893. sm. f°. Kuala Lumpur, 1894.

——— Annual report on the State of Negri Sembilan for the year 1893. sm. f°. s.l.e.a.

Strassburg, Meteorologischer Landesdienst.—Ergebnisse der meteorologischen Beobachtungen im Reichsland Elsass-Lothringen im Jahre 1892. Herausgegeben von . . . H. Hergesell. la. 4°. Strassburg, 1894.

——— Uebersicht über die Witterungs-Verhältnisse Elsass-Lothringens. 1894. Jan.–Dec. Beilage der Strassburger Correspondenz, 1894–95. 4°.

Stuttgart, Kgl. Statistisches Landesamt. Meteorologische Centralstation.—Deutsches meteorologisches Jahrbuch. Jahrg. 1893. Meteorologische Beobachtungen in Württemberg. Mitteilungen der mit dem Königlichen statistischen Landesamt verbundenen meteorologischen Centralstation. la. 4°. Stuttgart, 1894.

——— ——— ——— Veröffentlichungen des K. Statistischen Landesamts. Witterungsübersicht . . . nach den Beobachtungen der württemb. meteor. Stationen. 1894, Jan.–Dec., year. f°. Sheets. (*Sonderabdruck aus Staats-Anzeigers für Württemb.*, 1894–95.)

|| **Sundell, A. F.**—Åskvädren i Finland. 1893. 8°. Helsingfors, 1894. [*Bidr. Känn. Finl. Natur o Folk. liv.*, 1894, *p.* 417.]

|| ——— En akustisk anemometer. la. 8°. (*Finska Vet.-Soc. Öfversigt*, xxxvi., 1894).

|| ——— Snötäckets höjd i Finland vintern, 1891–92. Föredraget den 29 Maj 1893. (*Fennia*, 9, *No.* 1.)

[Sydney Observatory.]—Meteorological observations at Sydney. 1893, Jan.–Dec. 8°. s.l.e.a.

[———] Results of rain, river, and evaporation observations made in New South Wales during 1893, under the direction of H. C. Russell. la. 8°. Sydney, 1894.

——— Weather chart of Australia and New Zealand. 1893. Jan.–Dec. f°. Sheets.

——— **Royal Society of New South Wales.**—Journal and proceedings. Vol. xxvii., 1893. 8°. Sydney, s.a.

|| **Symons, G. J.**—On the amount of evaporation. 8°. (*British Rainfall*, 1889.)

|| ——— English meteorological literature, 1337–1699. la 8°. (*Rep. Chicago Meteor. Congr., Aug.*, 1893, *Part* ii., *p.* 338.)

Symons's Monthly Meteorological Magazine.—Vol. xxix., 1894. 8°. London, 1895.

Symons, G. J., and Wallis, H. S.—British rainfall, 1893. On the distribution of rain over the British Isles, during the year 1893 . . . 8°. London, 1894.

Syracuse, Osservatorio Centrale di Siracusa.—Osservazioni meteorologiche fatte nell' osservatorio centrale di Siracusa e nelle stazioni della rete meteorico-agraria della provincia. Anno xvii., 1893, Jan.–Dec. 8°. Siracusa, 1893.

Tacubaya, Observatorio Astronómico Nacional.—Anuario. 1895. Año xv. Formado bajo la dirección del Ingeniero A. Anguiano. sm. 8°. México, 1894.

Tebbutt, J.—Report of Mr. Tebbutt's Observatory, the Peninsula, Windsor, New South Wales, for the year 1893. 8°. Sydney, 1894.

* **Theophrastus of Eresus** on winds and on weather signs. Translated, with an introduction and notes, and an appendix on the direction, number, and nomenclature of the winds in classical and later times, by J. G. Wood, and edited by G. J. Symons. 8°. London, 1894.

* **Thompson, R.**—Journal of meteorological observations made in the garden of the Horticultural Society at Chiswick during the years 1831–1840. 4°. (*Trans. Hortic. Soc., 2nd ser.*, i., *pp.* 343, 419, 483; ii., *pp.* 1, 73, 129, 189, 317, 481, 529.)

See also Booth, W. B., and Thompson, R.

Tiflis, Physikalisches Observatorium.—Beobachtungen. 1892. la. 4°. (Tiflis), 1894.

|| **Todd, Sir C.**—Meteorological work in Australia: a review. 8°. [?Where from.]

Tokio, Central Meteorological Observatory.—Monthly report. Meteorological observations in Japan. 1893. Jan.-Dec. la. 8°. s.l.e.a.

——— ——— Storm signal stations in Japan. January, 1894. f°. Sheet.

——— ——— Weather maps. 1894. Jan.-Dec. 4°. Sheets.

* || **Tomlinson, C.**—On the claim of Dr. Wells to be regarded as the author of the "theory of dew." 8°. Edinburgh, 1861. (*Edinb. New Phil. Journ., new ser.*, 1861, *Jan.*)

Toronto, Magnetical Observatory.—General meteorological register for the year 1893. 8°. s.l.e.a.

Toronto, Meteorological Service, Dominion of Canada.—Monthly weather review. 1893. Jan.-Dec. la. 4°. s.l.e.a.

——— ———. Report. By C. Carpmael. 1889. la. 8°. Ottawa, 1893.

|| **Trabert, W.**—Zur Theorie der elektrischen Erscheinungen unserer Atmosphäre. la. 8°. Wien, 1894. (*Sitzungsb. k. Akad. Wissensch. Wien, math. naturw. Cl.*, ciii., 1894, *p.* 1023.)

Trieste, I. R. Accademia di Commercio e Nautica.—Osservazioni meteorologiche instituite all' Osservatorio Marittimo. 1894, Jan.-Dec., and Results. oblong la. 8°. Sheets.

——— **Osservatorio Astronomico-Meteorologico.**—Rapporto annuale . . . contenente le osservazioni meteorologiche di Trieste e di alcune altre stazioni Adriatiche per l'anno 1892. Vol. ix. la. 4°. Trieste, 1895.

Trinidad, Royal Botanic Gardens.—Annual report, 1893. sm. f°. Port of Spain, 1894.

——— ——— Meteorological returns. 1894, Jan.-Dec. sm. f°. Sheets.

Tyrer, R.—The meteorology of Cheltenham. Abstract of meteorological observations taken at the Modern School, Cheltenham, during 1892–1894. la. f°. 3 sheets.

Upsala.—Extrait des procès-verbaux de la première réunion de Comité Météorologique International tenue à Upsal, en août 1894. sm. 8°. (Upsala, 1894.)

——— **Observatoire Météorologique de l'Université.**—Bulletin mensuel. Vols. xxv.-xxvi. 1893-94. Par H. H. Hildebrandsson. 2 vols., la. 4°. Upsal, 1893-94.

Utrecht, Koninklijk Nederlandsch Meteorologisch Instituut.—Onweders in Nederland. Deel xiv., 1893. la. 8°. Amsterdam, 1894.

——— ——— De stroomen op de Nederlandsche kust. 2de Vermeerderde druk. la. 4°. Utrecht, 1894.

In the English language also.

Vaughan, J. D. W.—Meteorological observations taken at Suva, Fiji, during 1893. sm. f°. (Suva, 1894.)

|| **Veeder, M. A.**—Solar electrical energy not transmitted by radiation. la. 8°. Rochester, N.Y., 1894. (*Roch. Acad. Sc.*, ii., 1894, *p.* 245.)

Veracruz, Observatorio-Meteorologico Central.—Registro de observaciones meteorologicas. 1894, Feb.-Dec. and Resumen. oblong la. 8°. Sheets.

|| **Very, F. W.**—Hail-storms. la. 8°. (*Trans. Acad. Sc. Art, Pittsburgh*, 1894.)

|| **Vienna, Kais. Akademie der Wissenschaften.**—Berichte der Commission für Erforschung des Östlichen Mittelmeeres. Dritte Reihe. la. 4°. (*Denkschr. k. Akad. Wissensch. Wien*, lxi.)

——— **K. K. Central-Anstalt für Meteorologie und Erdmagnetismus.**—Beobachtungen. 1894, Jan.-Dec., and Results. 8°.

——— ——— Jahrbücher. Jahrg. 1892. Neue Folge, xxix. Bd. la. 4°. Wien, 1894.

——— ——— Telegrafischer Wetterbericht. Jahrg. xviii., 1894. Jan. 1–Dec. 31. la. 4°. Sheets.

——— **Sonnblick Verein.**—Jahres-Bericht des Sonnblick-Vereines für das Jahr. 1893. II. sm. f°. Wien, 1893.

Villa Colon, Observatorio Meteorológico del Colegio Pio. — Boletin mensual. Año i., Nos. 1–3; ii., Nos. 1–12, 1889–90. la 8°. Monte Video, 1888, 1890.

Volante, G.—Observazioni meteorologiche fatte in Alessandria alla Specola del Seminario. 1880, 1893. Anni xxxiii., xxxvi. 2 vols. la. 8°. Alessandria, 1891, 1894.

|| **Ward, R. De C.**—List of cloud photographs and lantern slides. la. 8°. (*Amer. Meteor. Journ.*, 1894, *July*.)

* **Washington.**—Protocols of proceedings of the International Marine Conference held in Washington, October 16 to December 31, 1889. With index. 3 vols., sm. f°. London, s.a.

Washington, Department of Agriculture, Weather Bureau.—Bulletin B. Currents of the great lakes, as deduced from the movements of bottle papers during the seasons of 1892 and 1893. By M. W. Harrington. oblong la. f°. Washington, 1894.

——— ——— ——— Bulletin No. 11. Report of the International Meteorological Congress, held at Chicago, Ill., August 11–24, 1893, under the auspices of the Congress Auxiliary of the World's Columbian Exposition. Part i. la. 8°. Washington, 1894.

——— ——— ——— Protection from lightning. By A. McAdie. 8°. Washington, 1894.

——— ——— ——— Report of the Chief of the Weather Bureau, 1891–92. la. 4°. Washington, 1893.

——— ——— ——— Summary of international meteorological observations. By H. H. C. Dunwoody. oblong la. f°. Washington, 1893.

——— ——— ——— Weather map. 1894. Jan. 1–Dec. 31. la. f°. Sheets.

——— **Hydrographic Office.**—Pilot charts of the North Atlantic Ocean. 1894, Jan.–Dec. and supplements. Charts. la. f°.

——— ——— Pilot chart of the North Pacific. 1894, Jan., July, Sept.–Dec. and supplement. Charts. la. f°.

——— **Smithsonian Institution.**—Annual reports. 1889–1893. 5 vols. la. 8°. Washington, 1890–94.

|| ——— **United States Naval Observatory.**—Magnetic observations at the United States Naval Observatory. 1892. la. 4°. Washington, 1893. (*Washington Obsns.*, 1889, *App.* 1.)

|| ——— ——— Meteorological observations and results. United States Naval Observatory. 1889. la. 4°. Washington, 1893. (*Washington Obsns.*, 1889.)

* **Wauchope, R.**—Meteorological and hydrographical notes. 8°. [*Mem. Werner. Nat. Hist. Soc. Edinb.*, iv., 1821, *p.* 161.]

* **Weather, On the.**—Two papers. la. 8°. (*Saturday Mag., Suppl.. Nos.* 267, 289, 1836, *pp.* 81 *and* 257.)

Wellington, Meteorological Office.—Return of annual rainfall in the Colony from 1864 to 1892. f°. (Wellington 1893.)

* **Wetter, Das.**—Meteorologische Monatschrift für Gebildete aller Stände. Herausgegeben von R. Assmann. xi. Jahrg., 1894. la. 8°. Braunschweig, 1894.

|| **Wharton, W. J. L.**—Address [on the Sea] to the Geographical Section of the British Association. Oxford, 1894. 8°. (*Rep. Br. Assoc. Advanc. Sc.*, 1894.)

* **White, W.**—Expériences sur l'air, et de l'effet de différentes espéces d'émanations sur cet elément; faites à Yorck par M. Guillaume White . . . lues à l'Assemblée de la Soc. R. de Londres le 5 Fév. 1778. 4°. (*Observ. sur la physique, &c.*, xviii., 1781, *p.* 142.)

* **Whymper, E.**—On the top of Ben Nevis. la. 8°. (*Leisure Hour*, 1894, *Sept.*, *p.* 694.)

|| **Wild, H.**—Magnetische Wirkung der Gestirne auf der Erde. sm. f°. St. Pétersbourg, 1894. (*Mél. phys. chim.*, xiii., *p.* 329.)

|| ——— Neue Normal-Lufttemperaturen für das Russische Reich. la. 4°. St. Pétersbourg, 1894. (*Mém. Acad. Imp. Sc. St. Pétersb.*, viii. *sér.*, *Cl. phys.-math.*, i., *No.* 8.)

In the Russian language. Introduction in German also.

|| ——— Ueber die Bestimmung der absoluten magnetischen Declination im Konstantinow'schen Observatorium zu Pawlowsk. la. 4°. St. Pétersbourg, 1894. (*Mém. Acad. Imp. Sc. St. Pétersb.*, viie *sér.*, xlii., *No.* 6.)

|| **Wilson, W. E.**—The thermal radiation from sun spots. Preliminary notes of observations made at Daramona, Streete, co. Westmeath, 1893. 8°. (*Proc. R. Soc.* lv., 1894, *p.* 246.)

|| ——— **and Gray, P. L.**—Experimental investigations on the effective temperature of the sun, made at Daramona, Streete, co. Westmeath. la. 4°. (*Phil. Trans.*, *Vol.* 185, 1894, *p. A.* 361.)

[Wilson, W. R.]—Abstract of meteorological observations made at Ladylaw, Hawick, during 1893. oblong sm. 8°. Sheet.

Woeikof, A.—Bodentemperatur unter Schnee und ohne Schnee in Katherinenburg am Ural. sm. f°. (*Meteor. Zeitschr.*, 1890, *Okt.*, *p.* 381.)

——— Gefrieren des Hudsonflusses in Albany, Vereinigte Staaten. sm. f°. (*Meteor. Zeitschr.*, 1891, *Sept.*, *p.* 333.)

——— Klimaschwankungen, resp. mehrjährige Perioden der Witterung und ihre Erforschung. sm. f°. (*Meteor. Zeitschr.*, 1892, *Juni*, *p.* 227.)

——— Klimatologische Zeit—und Streitfragen.

I. Bemerkungen über den Einfluss von Land und Meer auf die Lufttemperatur

IV. Sind die Winter im Norden wärmer geworden?

V. Kontinentales und ozeanisches Klima.

VI. Abhängigkeit der Regen von der Aenderung des Querschnittes der Luftströme.

4 papers. sm. f°. (*Meteor. Zeitschr.*, 1888, *Jan.*, *p.* 17; *Sept.*, *p.* 334; 1894, *Jan.*, *p.* 1; 1894, *Nov.* *p.* 401.)

|| ——— Das Klima und die Kultur. Sm. f°. (*Ausland*, 1891, *Nr.* 16.)

——— Mehrjährige Schwankungen der Tiefentemperaturen des Genfersees und anderer Seen und Binnenmeere wärmerer Gegenden. Sm. f°. (*Meteor. Zeitschr.*, 1892, *Juni*, *p.* 228.)

——— Regenfall des südwestlichen Transkaukasien. Sm. f°. (*Meteor. Zeitschr.*, 1894, *Nov.*, *p.* 412.)

[———] The radical differences in the climate of Russia as compared with other countries, and especially with North America. The influence of the climate on the propagation of cultivated plants, and on the duration of vegetation. Methods of collecting meteorological data. la. 8°. (? *Chapter on "The Climate" in "Agriculture and Forestry in Russia."*)

——— Der tägliche Gang der Temperatur und der Hydrometeore in Nordindien. sm. f°. (*Meteor. Zeitschr.*, 1894, *Nov.*, *p.* 403.)

Wollny, E.—Forstlich meteorologische Beobachtungen. Dritte Mittheil. 8°. (*Forschungen auf dem Geb. Agrik.-phys.*, *Heidelberg*, xvii., *Heft* 1, 2.)

——— Untersuchungen über das Verhalten der atmosphärischen Niederschläge zur Pflanze und zum Boden. 8°. (*Forschungen auf dem Geb. Agrik.-phys.*, *Heidelberg*, xvii., *Heft.* 3, 4.)

York, Yorkshire Philosophical Society.—Annual report . . . . for 1893. la. 8°. York, 1894.

Zürich, Schweiz. Departement des Innern.—Graphische Darstellung der schweizerischen hydrometrischen Beobachtungen. 1894. la. f°. Sheets.
For the second half of the year the title is in French.

—— **Schweizerische Meteorologische Central-Anstalt.** — Annalen. 1892. "Der Schweiz. meteor. Beob." xxix. Jahrg. 4°. Zürich, s.a.

—— —— Wetterbericht. 1894, Jan. 1–Dec. 31. sm. f°. Sheets.

APPENDIX XIV.

Account of Receipts and Payments for the year ending 31st March 1895.

Receipts.	£	s.	d.	Payments.	£	s.	d.	£	s.	d.
Balance from year 1893–94 -	1,517	12	11	Administration:						
Parliamentary Vote - -	15,300	0	0	Payment of Council -	987	10	0			
Repayment of expenses charged under—				Secretary - -	800	0	0			
				Salaries and wages -	891	6	9			
£ s. d.				Rent, fuel, and lighting	696	12	4			
(1.) Incidental expenses - 3 7 9				Incidental and contingent expenses -	194	15	8			
(2.) Observatories 31 17 4				Furniture and fittings	110	12	8			
				Pensions - -	159	3	3			
				Expenses incidental to International Meteorological Congress -	30	13	2			
	35	5	1					3,870	13	10
Supply of Information:				Special Researches:						
				Salaries and other charges - -	-	-	-	883	1	2
Daily Weather Charts and Forecasts - 293 12 5				Land Meteorology:						
6 p.m. Charts - 25 0 0				Observatories and stations, including remuneration of observers - -	2,259	5	4			
Reports for Press Agencies, &c. 96 3 10				Salaries: —Discussion and reduction of observations, &c. -	1,370	10	3			
Telegrams - 200 11 10										
	615	8	1					3,629	15	7
Sale of Instruments, &c.:				Weather Information and Forecasts:						
Royal Navy - 4 11 2				Telegraphic reports and storm warnings, remuneration of observers, &c. -	2,538	10	0			
Mercantile Marine account - 9 16 0				Salaries: — Preparation and issue of reports and forecasts -	1,861	13	9			
M.O. (Stations) account - 29 4 11										
	43	12	1					4,400	3	9
Repayment of Miscellaneous Commissions executed for Colonial and Foreign Institutions, &c. - -	23	18	0	Inspections:						
				Salaries and travelling expenses - -	-	-	-	436	16	5
Commission charged on work done for Colonies, &c. -	3	16	6	Ocean Meteorology:						
				Salaries: —Discussion and reduction of observations - -	1,590	16	0			
				Expenses incidental to the supply of instruments: —						
				Proportion for care and issue of instruments - -	200	0	0			
				Royal Navy - -	879	17	11			
				Mercantile Marine -	154	8	1			
				Distant island and coast stations -	10	0	0			
								2,835	2	0
				Miscellaneous Commissions executed for Colonial and Foreign Institutions, &c. - -	-	-	-	41	9	0
				Balance:						
				Cash at Bank -	1,393	9	4			
				„ at Office -	49	1	7			
								1,442	10	11
£	17,539	12	8				£	17,539	12	8

In the year 1894–95 the sum of 1,528*l.* 0*s.* 10*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires, &c.

APPENDIX XV.

List of the Principal Papers printed in various Reports issued by the Office from the Year 1866.

I.—Daily Weather Report.

Year.	Page.	——
1891 (July to Dec.).	1	Mean Values of Barometric Pressure for each Month and for the Whole Year—derived from Observations made at 8 a.m. daily during the 20 Years 1871–90.
1891	2 and 3	Mean Values of the Dry Bulb and Wet Bulb Temperatures for each Month and for the Whole Year, derived from Observations made at 8 a.m. daily during the 20 Years 1871–90.
,,	4 and 5	Mean Values of the Daily Maximum and Minimum Temperatures, and of the Maximum and Minimum combined, for each Month and for the Whole Year—derived from Observations extending over the 20 Years 1871–90.
,,	6	Mean Rainfall for each Month and for the Whole Year-derived from Observations extending over the 25 Years 1866–90.

II.—Weekly Weather Report.

Year.	Page.	——
1884	V.	Table A.—Showing for each Degree of Latitude, from 49° N. to 58° N. the Total Number of Hours during which the Sun is above the Horizon, in each Month of the Four Quarters of the Year.
,,	VI.	Table B.—Showing for each Degree of Latitude, from 49° N. to 58° N. the Total Number of Hours during which the Sun is above the Horizon, in each Week of the Year.
1889	[1–9]	Summaries of Rainfall and Mean Temperature, for the First, Second, Third, and Fourth Quarters, and for the whole Year, during the Twenty-four Years, 1866 to 1889. [Contains Separate Yearly Values from the year 1866.]
1890	[17]	Table I.—Showing for each District, during the Thirteen Years 1878–90, the Mean Aggregate Numbers of Rainy Days, from the beginning of the Year to the end of each Week in the Year.
,,	[18]	Table II.—Showing for each District, during the Thirteen Years 1878–90, the Mean Aggregate Amounts of Rainfall, from the beginning of the Year to the end of each Week in the Year.
,,	[19]	Table III.—Showing for each District, during the Thirteen Years 1878–90, the Mean Aggregate Values for Accumulated Heat above 42° F., from the beginning of the Year to the end of each Week in the Year.
,,	[20]	Table IV.—Showing for each District, during the Thirteen Years 1878–90, the Mean Aggregate Values for Accumulated Heat below 42° F., from the beginning of the Year to the end of each Week in the Year.
,,	[21]	Table V.—Showing for each District, during the Ten Years 1881–90, the Mean Aggregate Numbers of Hours of Bright Sunshine, from the beginning of the Year to the end of each Week in the Year.
,,	[22]	Table VI.—Showing for each District, during the Ten Years 1881–90, the Mean Per-centages of the Possible Amount of Bright Sunshine, from the beginning of the Year to the end of each Week in the Year.
,,	[23]	Table I.—Showing in Degrees Fahrenheit for each District, and for the Thirteen Years 1878–90, the Mean Temperature of the Air for each Week in the Year.

Year.	Page.	——
1891	VI.–VII.	Table I.—Showing for the Stations included in the Weekly Weather Reports and Monthly Summaries, the Mean Values of the Daily Maximum and Minimum Temperatures, and of the Maximum and Minimum combined, for each Month and for the whole Year, derived from Observations extending over the Twenty Years 1871–90.
„	VIII.	Table II.—Showing for the Stations included in the Weekly Weather Reports and Monthly Summaries, the Mean Rainfall for each Month and for the whole Year, derived from Observations extending over the Twenty-five Years 1866–90.
„	IX.	Table III.—Showing, for each Month and the Whole Year, for certain Stations included in the Weekly Weather Reports and Monthly Summaries, the Mean Numbers of Hours of Bright Sunshine, together with the Per-centages of the Possible Duration, in each instance, derived from Records extending over the Ten Years 1881–90.
1894	[1–9]	Summaries of Rainfall and Mean Temperature, for the First, Second, Third, and Fourth Quarters, and for the Whole Year, during the Twenty-nine Years, 1866 to 1894. [For Separate Yearly Values for 1866–89, *see* 1889 [1–9].]

III.—Monthly Weather Report.

Year.	Page.	——
1884	[i.]	On London Rain. By W. J. Russell, Ph.D., F.R.S.
„	[ii.]	On the Amount of Carbonic Acid in London Air. By W. J. Russell, Ph.D., F.R.S.
1885	[i.]	On the Impurities in London Air. By W. J. Russell, Ph.D., F.R.S.
„	[ii.]	Table showing the Mean Monthly and Annual Rainfall at the Weekly and Monthly Weather Report Stations for the 20 Years 1866 to 1885.

IV.—Quarterly Weather Report.

Year.	Page.	——
1869	43	Factors for Calculation of Gradients.
„	[1]	Notes on Easterly Gales, by R. H. Scott.
1870	iii.	Description of Observatories, with illustrations of thermometer screens.
„	[7]	Mean Barometrical Pressure at Telegraphic Reporting Stations, 1866–70.
„	[11]	Rainfall at Telegraphic Reporting Stations, 1866–70.
„	[23]	Bessel's Paper on the Determination of the Law of a Periodical Phenomenon. (Translation).
1871	[7]	Discussion of Anemometrical Results for Orkney, 1863–68.
„	[57]	Mean Monthly Rainfall at several stations.
„	[59]	Constants for Bessel's Formula for 1869–70.
1872	[13]	Discussion of the Anemometrical Results at Bermuda from 1st April 1859 to 31st March 1863.

Year.	Page.	—
1873	[13]	Rainfall of the London District for Sixty Years, 1813–72. By G. Dines, F.M.S., with diagram.
„	[17]	Results of Observations taken at certain Stations of the Second Order in connection with the Meteorological Office, 1873.
1874	[13]	Results of Observations taken at Stations of the Second Order, 1874.
„	[26]	On the Winds at Liverpool, by W. W. Rundell.
1875	[1]	Observations taken at Nine Stations of the Second Order, 1875.
„	[89]	Mean Monthly Results for the seven Observatories for the Lustrum, 1871–75.
„	[123]	Particulars of Telegraphic Stations.
„	[126]	Mean Rainfall at Telegraphic Stations for the 5 Years, 1871-75.
„	[131]	„ „ „ „ „ 10 Years, 1866–75.
„	[132]	Mean Barometrical Pressure at Telegraphic Stations for the 5 Years, 1871–75.
„	[132]	Mean Barometrical Pressure at Telegraphic Stations for the 10 Years, 1866–75.
„	[133]	Mean Temperature at Telegraphic Stations for the 5 Years, 1871–75.
„	[134]	Extreme Temperatures at Telegraphic Stations for the 4 Years, 1872–75.
1876	[13]	Report on the Reduction of Greenwich Curves for 1875 to a Common Standard with those of Kew (with 25 plates).
„	[20]	Results of Observations made at the Pagoda, Kew Gardens, to determine the Influence of Height on Temperature, &c. (4 plates). By R. H. Scott, F.R.S.
„	[39]	Comparison of Results obtained by means of the Harmonic Analyser, with similar Results got from Measurement and Numerical Calculation.
1877	[13]	On the Diurnal Range of Rainfall at the Seven Observatories in connection with the Meteorological Office, 1871–80. By R. H. Scott, F.R.S. (5 plates).
„	[35]	Report on Evaporimeters, by W. N. Shaw, M.A. (2 plates).
1878	[13]	On the Computation of the Quantity of Heat in excess of any Fixed Base Temperature, received at any place during the course of the Year, &c. By Lieut.-Gen. Strachey, R.E., F.R.S.
1879	[13]	Report on Experiments made at Strathfield Turgiss in 1869 with Thermometer Stands or Screens of various patterns, &c. By F. Gaster.
„	[41]	Report on Hygrometric Methods, &c. Part I. By W. N. Shaw, M.A.
1880	[13]	Report on Experiments made at the Kew Observatory with Thermometer Screens of different patterns during 1879, 1880 and 1881. By G. M. Whipple.
„	[19]	Tables and Diagrams illustrating the Diurnal Range of Barometric Pressure in the British Isles during the Years 1876–80. By F. C. Bayard, L.L.M. (5 plates.)

V.—Report of the Meteorological Committee of the Royal Society.

Year.	Page.	——
1867	27	A Description of the Self-Recording Instruments recently erected by the Meteorological Committee of the Royal Society in various parts of the United Kingdom, with plates.
1869	25	Note upon a Self-registering Thermometer adapted to Deep-Sea Soundings, by W. A. Miller, M.D., Treasurer and V.P.R.S., extracted from Proceedings of Royal Society, vol. XVII., p. 482.
,,	32	On the Principle of the Pantagraph, designed by F. Galton.
,,	36	Description of a Self-Recording Rain-gauge, invented by Robert Beckley, of the Kew Observatory; made by James Hicks, London.
1870	31	Description of the Pantagraph, designed by Mr. Galton.
1871	24	,, ,, Trace Computer, designed by Mr. Galton.
,,	28	Summary of the Results obtained for Square 3 for January.
1872	27	A Summary of the Results obtained from the Discussion of the Information for Square 3, being the Region of the Doldrums in the Atlantic. By Capt. H. Toynbee, Marine Superintendent.
1873	26	Summary of the General Course of Action taken at the Meteorological Congress at Vienna in 1873.
1874	33	The International Maritime Conference.
1876-77	31	Index of the Information existing in the Office for the entire Ocean, with charts.

Va.—Report of the Meteorological Council.

Year.	Page.	——
1877–78	21	Account of the Experiments on Atmospheric Electricity, conducted at Kew Observatory. By Prof. J. D. Everett.
1879–80	28	On the Effect of Sluggishness on the Readings of Marine Barometers on Shore, by Prof. Stokes, F.R.S.
,,	32	Description of the Card Supporter for Sunshine Recorders adopted at the Meteorological Office, by Prof. Stokes, F.R.S.
,,	43	On the Methods available for the Determination of the Humidity of the Atmosphere, by W. N. Shaw, M.A.
,,	46	Memorandum as to the Employment of the Harmonic Analyser in the Meteorological Office, by Prof. Stokes, F.R.S.
1880–81	25	On the Working of the Harmonic Analyser (by Prof. Stokes)
,,	27	Report on Fogs. (W. J. Russell.)
,,	28	,, ,, Hygrometers and Evaporimeters, presented to the Meteorological Council, May 10, 1881. (W. N. Shaw.)
,,	31	Ad-interim Report on the Observation of Clouds of the "Cirrus" Type. (F. Gaster.)
,,	33	Preliminary Report on the Photo-Nephograph. (W. de W. Abney.)

Year.	Page.	
1881–82	25	On Fogs. (W. J. Russell.)
,,	25	Preliminary Report on Hygrometry. (W. N. Shaw.)
,,	29	Report on the Results of a Tentative Reduction of a Year's Electrograms at the Kew Observatory. (G. M. Whipple.)
1882–83	27	On the Results obtained by the use of the Harmonic Analyser.
1884–85	22	Note on Work done with the Harmonic Analyser.
,,	130	Maps showing information existing in the Office for the Ocean.
1885–86	22	Memorandum on Cloud Photography, by Prof. Stokes, F.R.S.
1886–87	21	On the Distribution of Gales round the Coasts of the British Isles, for the 15 years 1871–85.
,,	23	Report on Occasional Telegrams received from Ben Nevis, by F. Gaster.
,,	24	Report on the Daily Weather Messages received from the United States (viâ Paris) during the three months January to March, 1887, by F. Gaster.
1887–88	22	On the History of the Severe Storms which visited the British Isles between August 1, 1882, and September 3, 1883, as traceable from the Atlantic Charts published by the Office. By Robert H. Scott, F.R.S., Secretary.
,,	26	Report on the severe partial Gales experienced on the Coasts of the British Islands during the 15 years 1871–85, by F. J. Brodie.
,,	30	Abstract of Report on Hygrometric Methods, by W. N. Shaw, M.A., reprinted from the "Proceedings of the Royal Society," No. 262.
1888–89	22	Notes of some Results of an Examination of the Atlantic Charts published by the Office, by R. H. Scott, F.R.S., Secretary.
,,	27	Memorandum on the Measurement of Squalls shown on the Traces yielded by Robinson Anemometers of the "Standard" Pattern, by R. H. Curtis.
1889–90	36	Note on Experiments on Pressure of Wind made by W. H. Dines, B.A.
,,	46	Experiments with Violle's Actinometer Apparatus.
,,	47	On the Work done with the Harmonic Analyser at the Meteorological Office.
1890–91	22	On Mr. Dines's Anemometer Experiments.
1891–92	23	On Anemometer Comparisons carried out by the aid of a Grant from the Meteorological Council by W. H. Dines, B.A.
1892–93	21	On the Construction of the Anemometer recently erected for trial on the roof of the Meteorological Office, by W. H. Dines, B.A.
,,	27	On the Harmonic Analysis of Hourly Observations of Air Temperatures at British Observatories, by Lieut.-Gen. R. Strachey, F.R.S.
1893–94	20	Report on the Performance of the Pressure-Tube Anemometer on the Roof of the Meteorological Office, by R. H. Curtis.

VI.—HOURLY READINGS of the SELF-RECORDING INSTRUMENTS of the OBSERVATORIES in connexion with the METEOROLOGICAL OFFICE.

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1883	[1]	Constants of formulæ expressing the mean daily range of temperature obtained by the use of the Harmonic Analyser.
1884	[1]	Tables and formulæ to facilitate the computation of harmonic coefficients. By Lieut.-General Strachey, R.E.

APPENDIX XVI.

LIST OF PUBLICATIONS, &c. issued under the Authority of the Meteorological Council.

OFFICIAL.

No. 1. Report of the Meteorological Committee for 1867. 1*s.*
2. Instructions for Meteorological Telegraphy. New Edition, 1891. Prepared for the use of observers exclusively.
3. Fishery Barometer Manual. (New edition, 1887.) 6*d.*
4. Charts showing the Surface Temperature of the South Atlantic Ocean in each Month of the Year. 2*s.* 6*d.*
5. Report of the Meteorological Committee for 1868. 5*d.*
6. Report of the Meteorological Committee for 1869. 10*d.*
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5*s.* each.
8. Barometer Manual. (Out of print. See Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5*s.* each.
10. Report of the Meteorological Committee for 1870. 10*d.*
11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2*s.* 6*d.*
12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2*s.* 6*d.*
13. A Discussion of the Meteorology of that Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. With Book of Charts, 5*s.*
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s.* each.
15. Report of the Meteorological Committee for 1871. 10*d.*
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5*s.* each.
17. Report of the Meteorological Committee for 1872. 1*s.*
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2*s.*
19. Quarterly Weather Report for 1873.—Parts I. to IV. 5*s.* each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20° — 30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20*s.*
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1873. 1*s.*
22. Report of the Meteorological Committee for 1873. 4*d.*
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2*s.*
24. Instructions in the Use of Meteorological Instruments. [Reprinted 1892.] (New edition in course of preparation.) 2*s.* 6*d.*
25. Quarterly Weather Report for 1874.—Parts I., II., and IV., 5*s.* each. Part III., 5*s.* 9*d.*
26. Report of the Meteorological Committee for 1874. 6*d.*

No. 27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. 24*s.*

28. Contribution to the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger.* 1*s.*

29. Report of the Meteorological Committee for 1875. 4*d.*

30. Quarterly Weather Report for 1875.—Parts I.—IV. 5*s.* each.

31. Report of the Meteorological Committee for 1876–7. 3*s.* 5*d.*

32. The Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. With Book of Charts. 15*s.*

33. Quarterly Weather Report for 1876 (New Series).—Part I., 6*s.*; Parts II., III., and IV., 5*s.* each.

*33A. Meteorological Observations at Stations of the Second Order for the year 1876.

33B. Meteorological Observations at Stations of the Second Order for the year 1877.

34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Vol. I.: Part I., 2*s.*; Part II., 10*s.*; Part III., 6*s.*; Part IV., 5*s.*; Part V., 6*s.*

35. Report of the Meteorological Council for 1877–8. 1*s.*

36. Report of the Proceedings of the Second International Meteorological Congress at Rome, 1879. 1*s.* 6*d.*

37. Report on the Meteorology of Kerguelen Island. By Rev. S. J. Perry, S.J., F.R.S. 3*s.*

38. Report of the Meteorological Council for 1878–9. 5*d.*

39. Meteorological Observations at Stations of the Second Order for the year 1878. 20*s.*

40. Aids to the Study and Forecast of Weather, by W. Clement Ley, M.A. 1*s.*

41. Report of the Meteorological Council for 1879–80. 1*s.*

42. Report of the Meteorological Council for 1880–81. 1*s.* 2*d.*

43. Meteorological Charts for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Charts, 25*s.*; Remarks, 7*s.*

44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E., by Capt. H. Toynbee, F.R.A.S. 7*s.* 6*d.*

45. Meteorological Observations at Stations of the Second Order for the year 1879. 20*s.*

46. Report on the Storm of October 13–14, 1881. By Robert H. Scott, F.R.S. 1*s.* 6*d.*

47. Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. 7*s.* 6*d.*

48. Report of the Meteorological Council for 1881–2. 1*s.*

49. Quarterly Weather Report for 1879. (New Series.) Parts I., II., and III., 6*s.* each; Part IV., 5*s.* 6*d.* Appendices and Plates. 27*s.*

50. Quarterly Weather Report for 1880. (New Series.) Parts I. and II., 6*s.* each; Part III., 4*s.*; Part IV., 6*s.* Appendices and Plates. 28*s.*

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* The Observations at Stations of the Second Order for the years 1873–1875 will be found in the Quarterly Weather Report for the respective years.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 51.* Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1881. (New Series.) Part I., 10*s.* 6*d.* Parts II., III., and IV., 21*s.* each.

52. Quarterly Weather Report for 1877. (New Series.) Part I., 10*s.*; Part II., 5*s.*; Part III., 4*s.* 6*d.*; Part IV., 6*s.* Appendices and Plates. 27*s.*

53. Meteorological Atlas of the British Isles. 5*s.* 6*d.*

54. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1882. Parts I. and II., 20*s.* each; Part III., 22*s.* 6*d.*; Part IV., 26*s.*

55. Quarterly Weather Report for 1878. (New Series.) Parts I., II., III., and IV., 6*s.* each. Appendices and Plates. 28*s.*

56. Sunshine Records of the United Kingdom for 1881. 4*s.*

57. Meteorological Observations at Stations of the Second Order for the year 1880. 34*s.* 6*d.*

58. Report of the Meteorological Council for 1882–3. 10½*d.*

59. Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. 21*s.*

60. Principles of Forecasting by means of Weather Charts. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition.) 2*s.*

61. A Barometer Manual for the Use of Seamen. (Second edition.) 1*s.* 3*d.*

62. Monthly Weather Reports for 1884. Jan., Feb., March, May —Nov., 1*s.* 6*d.* each. April (with 2 Appendices), 2*s.* 6*d.* Dec., 1*s.* 9*d.*

63. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1883. Parts I., II., and III., 21*s.* each; Part IV., 30*s.*

64. Report of the Meteorological Council for 1883–4. 1*s.* 2*d.*

65. Monthly Weather Reports for 1885. Jan. to Dec., 1*s.* 6*d.* each.

66. Meteorological Observations at Stations of the Second Order for the year 1881. 35*s.*

67. Report of the Meteorological Council for 1884–5. 4*s.* 4*d.*

68. Monthly Weather Reports for 1886. Jan. to Dec., 1*s.* 6*d.* each.

69. Meteorological Observations at Stations of the Second Order for the year 1882. 35*s.*

70. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1884. Part I., 12*s.*; Part II., 10*s.*; Part III., 10*s.* 6*d.*; Part IV., 15*s.*

71. Synchronous Weather Charts of the North Atlantic and the adjacent Continents. Aug. 1, 1882, to Sept. 3, 1883. Parts I. to IV. (33 sheets each.) 17*s.* each.

72. Report of the Meteorological Council for 1885–86. 8*d.*

73. Meteorological Observations at Stations of the Second Order for the year 1883. 30*s.*

74. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1885. Parts I. and II., 11*s.* each; Part III., 10*s.* 6*d.* Part IV., 12*s.*

* For the years 1874–1880 the Hourly Readings were issued in lithographed form. Price 20*s.* per annum.

No. 75. Report of the Meteorological Council for 1886–87. 8*d.*

76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10*s.* 6*d.* Supplementary Chart, 6*d.*

*77. Monthly Weather Reports for 1887. January to April, 1*s.* 6*d.* each. May to December, in wrapper, 12*s.*

78. Meteorological Observations at Stations of the Second Order for the year 1884. 32*s.*

79. Report of the Meteorological Council for 1887–88. 1*s.*

80. Daily Weather Charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. 10*s.*

81. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1886. Parts I., II., and III., 10*s.* 6*d.* each. Part IV., 12*s.* 6*d.*

82. Meteorological Observations at Stations of the Second Order for the year 1885. 31*s.*

83. Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and the Army Medical Department. 1852–1886. 23*s.*

84. Report of the Meteorological Council for 1888–89. 5½*d.*

†85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4*d.* per week. With Appendices and Monthly Supplements, priced separately.

86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

87. Weekly Weather Report for the year 1890. Vol. VII. Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

88. Meteorological Observations at Stations of the Second Order for the year 1886. 25*s.*

89. Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo. 1886–88. By the late W. Reid, M.D. 8*s.* 6*d.*

90. Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. 7*s.*

91. Report of the Meteorological Council for 1889–90. 7½*d.*

92. Meteorological Charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras Hafún. 6*s.*

93. Harmonic Analysis of Hourly Observations of Air Temperature and of Pressure at British Observatories. 12*s.*

94. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1887. 16*s.*

95. Meteorological Observations at Stations of the Second Order for the year 1887. 24*s.*

96. Weekly Weather Report for the year 1891. Vol. VIII., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual subscription, including Supplements and Appendices, post paid 30*s.*

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* Publication continued after this year as a Supplement to the Weekly Weather Report.

† The publication of the Weekly Weather Report began in February 1878. Annual subscription, 1878–1883, 12*s.* 6*d.*; 1884–1887, 21*s.* 2*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 97. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1888. 20*s.*

98. Ten Years Sunshine in the British Isles, 1881–90. 2*s.*

99. Report of the Meteorological Council for 1890–91. 5½*d.*

100. Weekly Weather Report for the year 1892. Vol. IX., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, Post paid, 30*s.*

101. Meteorological Observations at Stations of the Second Order for the year 1883. 22*s.*

102. Report of the International Meteorological Conference at Munich in 1891. 1*s.* 6*d.*

103. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1889. 15*s.*

104. Report of the Meteorological Council for 1891–92. 6*d.*

105. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1890. 20*s.*

106. Meteorological Charts of the Red Sea. 21*s.*

107. Weekly Weather Report for the year 1893. Vol. X., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30*s.*

108. Meteorological Observations at Stations of the Second Order for the year 1889. 34*s.*

109. Report of the Meteorological Council for 1892–93. 8*d.*

110. Meteorological Observations at Stations of the Second Order for the year 1890. 34*s.*

111. Weekly Weather Report for the year 1894. Vol. XI., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30*s.*

112. Report of the Meteorological Council for 1893–94. 7½*d.*

113. Hourly Means of the Readings obtained from the Self-recording Instruments at the Five Observatories under the Meteorological Council, 1891. 32*s.* 6*d.*

114. Rainfall Tables of the British Isles for 1881–90. (In the Press.)

115. Report of the Meeting of the International Meteorological Committee at Upsala, 1894. 1*s.*

116. Weekly Weather Report for the year 1895. Vol. XII.. Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30*s.*

117. Meteorological Observations at Stations of the Second Order for the Year 1891. (In the Press.)

118. Hourly Means of the Readings obtained from the Self-recording Instruments at the Five Observatories, for the year 1892. (In the Press.)

119. Report of the Meteorological Council for 1894–95.

NON-OFFICIAL.

No. 1. Report of an Inquiry into the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6*d.*

2. Report to the Committee of the Meteorological Office on the Meteorology of the North Atlantic.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

3. Report to the Committee of the Meteorological Office on the Use of Isobaric Curves.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6*d.*

5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6*d.*

6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1872. 1*s.*

7. Notes on the Form of Cyclones in the Southern Indian Ocean. — By C. Meldrum, M.A., F.R.S. [Out of Print.]

8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 1873. 6*d.*

9. Report of the Permanent Committee of the First International Meteorological Congress at Vienna for 1874. 1*s.* 6*d.*

10. On the Physical Geography of the part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875.—By Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s.* 6*d.*

11. Report of the Permanent Committee of the First International Congress at Vienna for 1876. With Supplement. 2*s.*

12. Reports to the Permanent Committee of the First International Meteorological Congress at Vienna on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s.*

13. Report of the Permanent Committee of the First International Congress at Vienna for 1878. 6*d.*

14. Report of the International Meteorological Committee. Meeting at Berne, 1880. 1*s.*

15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. 2*s.* 6*d.*

16. Report of the Third Meeting of the International Meteorological Committee, held at Paris, September 1885. 1*s.*

17. Report of the Fourth Meeting of the International Meteorological Committee, held at Zürich, September 1888. 4*d.*

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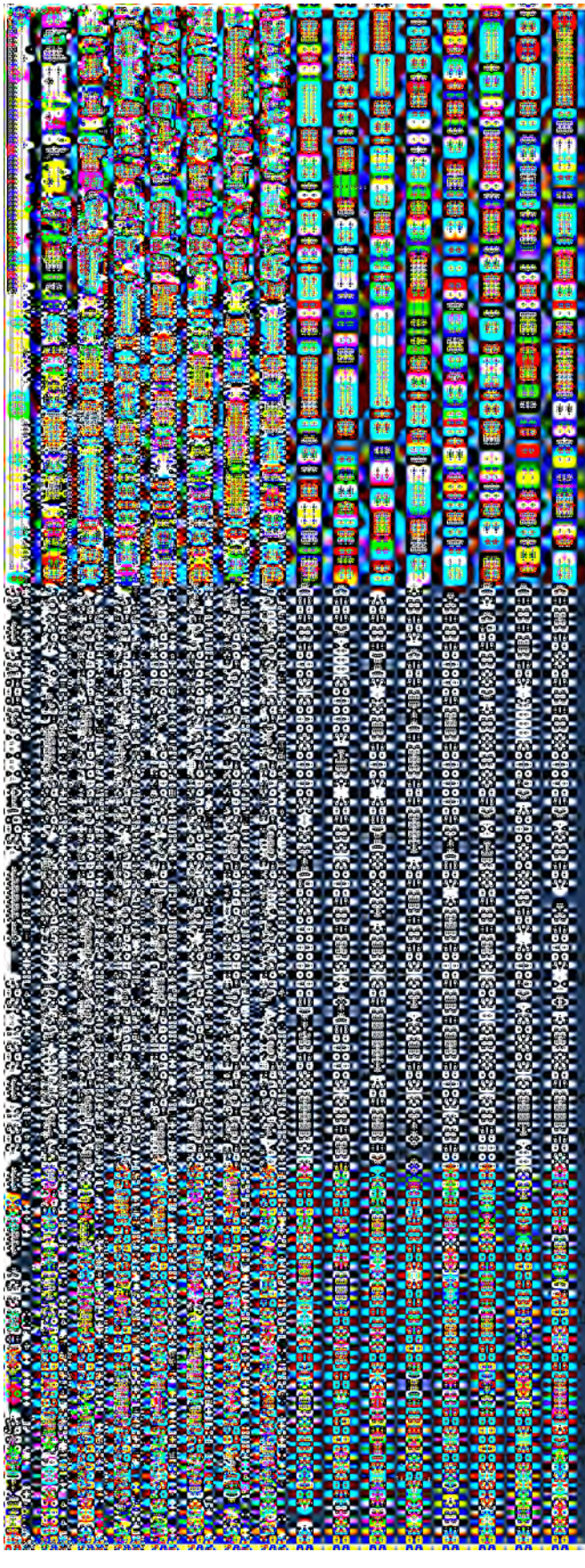

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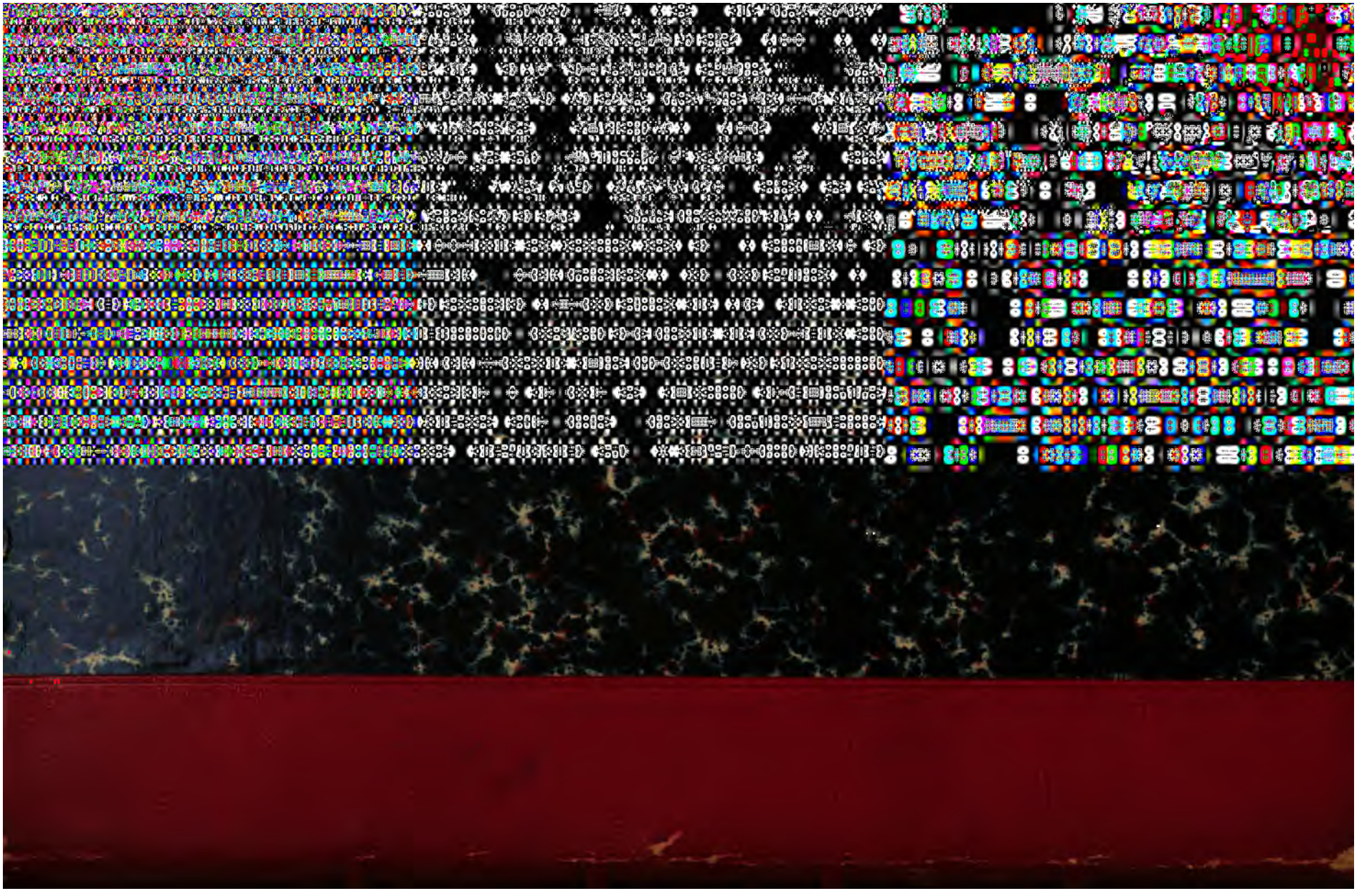
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